SEPTEMBER 4, 1961

American Machinist / Metalworking Manufacturing

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Boring two of the welded steel housings for giant sugar mill, see page 1

- **How to avoid "hard spots" in high-strength steels,** p97
- **Quick estimates for dies, jigs, and fixtures,** p111

NUMERICALLY CONTROLLED DRILLING...

A short cut to a fast payoff

by Gordon Deagle
Engineer, Bore-Matic Division
The Heald Machine Company

Drilling has long been one of the simplest and most universally used operations in the machine tool field. Furthermore, of the various numerically controlled machines, the *drill* is one of the quickest to return its cost through resultant savings.

This is due largely to the fact that the increased accuracy required in most of today's drilling operations has heretofore been met by building expensive jigs and fixtures. And often these special fixtures have been made obsolete due to design changes long before they have repaid their cost through savings.

Many people think of numerical control only in terms of very high production. But with drilling this is not the case at all.

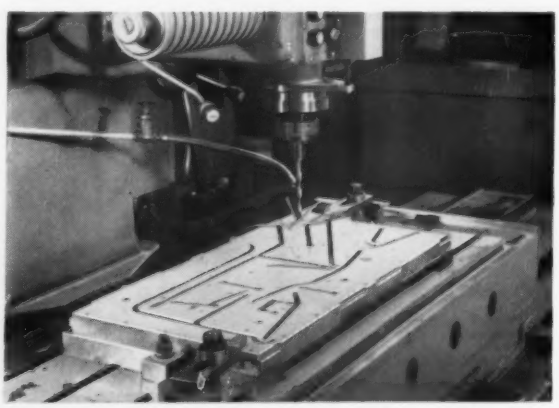
The HEALDRILL, a high-precision automatic tape-controlled drilling machine, has been profitably applied on many short run jobs involving frequent changeovers. In fact operating experience in our own drill department proves that the cost savings are even greater where small lots of many different parts are involved than on high production jobs where the expense of special jigs and fixtures might be recovered before obsolescence.

A case in point is the Heald hydraulic valve plate illustrated here in a setup on the machine. A mating pair of these plates forms a multi-channel valve panel which requires 54 drilled holes, 44 drilled and counterbored holes, and 75 holes that are drilled, reamed and tapped. All of these operations are now done on the numerically-controlled HEALDRILL and all cycle functions are fully automatic except for tool changes. Based on manufacturing in lots of 10, with a total of 200 before obsolescence of the part, the HEALDRILL method has saved $39.90 per panel over the jig method. This is a total saving of $7,980.00 on one job alone—almost 20% of the entire cost of the machine!

Hole positioning, feeds, speeds, rapid traverse and full depth limits, and drilling or tapping cycle are selected by the tape and hence are completely independent of the operator's skill, accuracy or speed. Tool changes, when required, are indicated by the machine and can be made in a matter of seconds. And total floor-to-floor time can be reduced by as much as 50 per cent. Changeover to another job requires no setup time except that required to insert a new tape in the control unit and locate the part on the table.

Preparation of the control tape for a new part is fast and relatively simple. With a HEALDRILL, sample and pilot lot production can be accomplished in days instead of weeks, and at minimum cost.

HEALDRILL in operation in drill department of The Heald Machine Company in Worcester, producing precision drilled, bored, counterbored, reamed and tapped parts for other Heald machines.



Hydraulic valve panels with 173 holes are precision drilled, counterbored and tapped on the HEALDRILL, at a saving of $39.90 per panel.

For complete information on the numerically-controlled HEALDRILL contact your Heald engineer—or send for a copy of Bulletin 2-20-48.

It Pays to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
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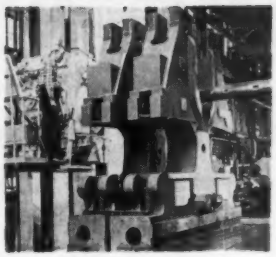
COVER:

Welded housings for sugar mill are bored on an 8-in. horizontal bar Farrel-Sellers machine at Farrel-Birmingham. Housings were assembled from cast steel and carbon plate from ⅛ to 5½ in. thick, supplied by Bethlehem Steel Co. The sugar mill is going to Argentina, will handle 6000 metric tons of sugar cane a day



American Machinist / *Metalworking Manufacturing*

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METALWORKING REPORT

. . . what's new and significant in manufacturing techniques and materials—direct from our own staff and round-the-world news bureaus

CUTTING . . . The shop machinist—not the steelmaker—puts those "hard spots" in high-strength steels. Research at Boeing has shown that poor machining techniques can create layers of "untempered" martensite that are harder than the cutting tool, hence impossible to machine in subsequent operations. From Boeing's research have come **important recommendations on shop handling of these super-steels.** See p97 for the details.

HEAT TREATING . . . Ultrasonically assisted nitriding reduces processing time and raises the microhardness of the nitrided layer. These are the findings of Russian researchers at Odessa Polytechnic Institute, who have been testing the effects of ultrasonic waves on gas and liquid nitriding of 35X10A steel (0.35% C, 1.5-1.8% Cr, 0.50-0.80% Al). **Ultrasonically assisted gas nitriding produced a deeper, harder case** than liquid nitriding.

ASSEMBLY . . . Epoxy pellets that require no pre-mixing come in shapes designed for any bonding job. All the user need do is place a pellet between two parts to be joined, then apply enough heat to melt the pellet. Consisting of epoxy formulations that have been partially reacted and then arrested, **the pellets show great promise for large production runs, especially in the bonding of dissimilar metals.** Full details on the new development will appear in an early issue.

FLAME CUTTING . . . A portable machine, which rides on its drive wheel, allows one-handed flame cutting of steel—from light-gage sheet up to 2-in.-thick plate. Operating at speeds up to 30 ipm, the machine has a clutch that permits free wheeling for hand-guided contour cuts. Called the Cadet by the Linde Div of Union Carbide Corp, **the 19-lb unit can be carried from job to job.** It operates on acetylene, propane, or natural gas, and can cut straight lines, circles, bevels, and some contours.

CUTTING . . . Wear resistance of zinc and aluminum can be sharply increased or decreased by using aqueous phosphate solutions as coolants. When a concentrated phosphate solution is used, **wear resistance of zinc and aluminum drops 5 and 6 times respectively.** Increased dilution, however, results in higher wear resistance with the maximum (an increase of 25% for zinc and 30% for aluminum as compared with water grinding) being achieved with 1:10 and 1:20 dilutions. This development, reported by V S Lapatukhin in a recent Soviet publication, **could be used to prolong tool life or facilitate machining.**

FINISHING . . . Excellent bonds between dissimilar metals have been produced by Armour research Foundation **by first flame-spraying metal surfaces with metallic oxides, then reducing the oxide to metal.** Sprayed nickel oxide applied to sand-blasted mild steel, then reduced in hydrogen at 1100 F for one hour, **produced a dense, pore-free, continous layer of nickel.** Only the outer layer was somewhat porous, although free from long cracks. Mixtures of nickel and copper oxides have given Monel coatings.

MATERIALS . . . A dry powder that liquefies upon heating makes low-cost molds for thermo-setting plastics. After it is poured into a reverse plaster and heated, the powder hardens to within 0.001 in. of the exact shape wanted. The Boeing development, which is believed to contain aluminum chips and epoxy resin, **brings cost of molds down to about half that of conventional metal construction.** Although the compound is so new that it doesn't yet have a name (it may be called Veritool), **it is being put into immediate production** by the American-Marietta Corp's Adhesive, Resin, and Chemical Div (Seattle).

FINISHING . . . Four-directional abrasive finishing for gears is done on a new machine—made by Michigan Tool Co (Detroit)—that uses a **gear-like tool made of high-strength plastic impregnated with abrasive.** Honing action is achieved by combining: rotation in tight mesh under controlled load; crossed-axis relationship between hone and work; high-speed axial oscillation of tool; reciprocating motion to traverse work across the hone. (See cut.) Also, with a suitable attachment, **it is possible to create or follow a limited degree of crowning or taper.**

INSPECTION . . . Ferromagnetic spring wire for auto valves undergoes continuous flaw inspection at production speeds at Associated Spring Corp (Bristol, Conn). The total system—developed in cooperation with Magnaflux Corp (Chicago)—**detects minute flaws anywhere within a few thousandths of the wire's surface** by a combination of electronic and mechanical systems. A continuous tape record is made and, **when an "off-spec" portion of wire passes through the instrument, it is marked with lacquer.** Instrument checks wire from 0.148 to 0.192-in. dia; company is developing similar equipment for other sizes.

CUTTING . . . Finest-grain tungsten carbide ever marketed is the claim for a new cutting tool material developed by Hoy Carbides Ltd, High Wycombe, Bucks, England. Called Hoybide CW, **material is composed of super-sub-micron-size grains** (commercially available US carbides range from one to eight microns in grain size.) and is said to **provide better finish and wear resistance than other grades** for machining high-strength, heat-resistant alloys.

FORMING . . . High-pressure water will form bulged parts in sheet or plate. General Dynamics/Astronautics (Point Loma, Calif) has used the process—which it calls decoction forming—to **produce a 6-ft-dia domed part from boiler plate.** Die looks like a large open kettle. When sheet or plate circle is laid over opening and clamped by a bolted ring, water at 65 to 250 psi is valved into the cavity and **plate forms into a bubble in a short time.** A second female-cavity die clamped on top allows shapes other than simple bubbles.

Continued on next page

Coming in AM/MM

- *How to meet job-shop deadlines*
- *New inert-gas barrier aids brazing*
- *Chemicals blank precision parts*

METALWORKING REPORT . . .

CUTTING . . . Trepanning has replaced drilling in about 50 jobs at the Fellows Gear Shaper Co, Springfield, Vt. Work is done on a G & L boring machine with a 4-in. spindle. Reason for the switch: **time savings of up to 80% over drilling from the solid.** Standardized tool bars, toolholders, and 3-step carbide tips give maximum economy and produce smooth-finish holes close to final size.

FORMING . . . Digital controls are now being supplied on forging presses by two European builders: Schloemann of Dusseldorf and Davy & United Engineering of Sheffield. The Schloeman arrangement **allows forgings to be planished accurately, dispensing with the use of calipers.** On the Davy & United 300-ton forging press (oil-hydraulic), **digital positioning controls prevent over-forging even of small pieces.** The operator's console has only six controls, for tonnage, thickness and return setting for the crosshead, crosshead direction, and speed.

FINISHING . . . To anchor paint firmly to galvanized metal, apply a new pre-coating solution. Called Top-Galva, the metallic solution is said to form a union with the zinc, deposing a non-corrosive, non-chipping surface. **Brushed or sprayed on the zinc, it provides an adhesive surface for the paint,** reducing the possibility of chipping, peeling, and blistering. Solution is a product of Rip-Trude Corp (Chicago).

FORMING . . . Ultimate tensile strength of cylinders, spheres, tubing is approximately doubled by bulging at —320 F. In a process called Ardeform (see p103), preform is made smaller than final size and lowered into a die set in a protective pit. After die and work are cooled with liquid nitrogen, high-pressure nitrogen gas is pumped in to expand the object. **Process precludes heat treating and mechanical expanding** of rocket motor cases.

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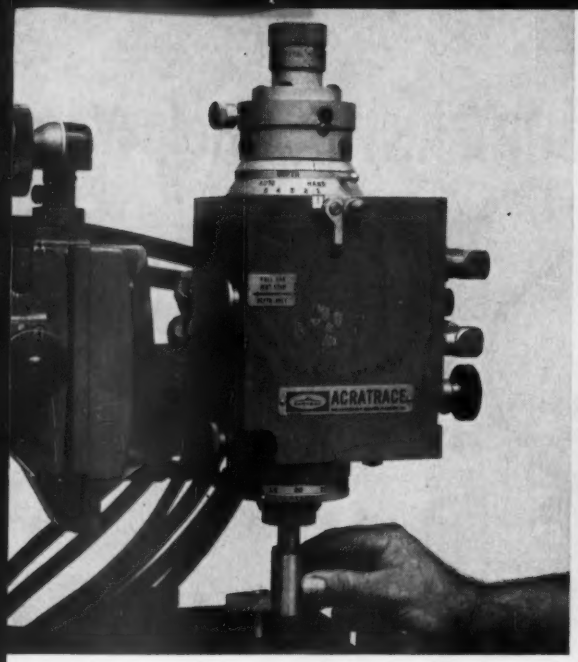

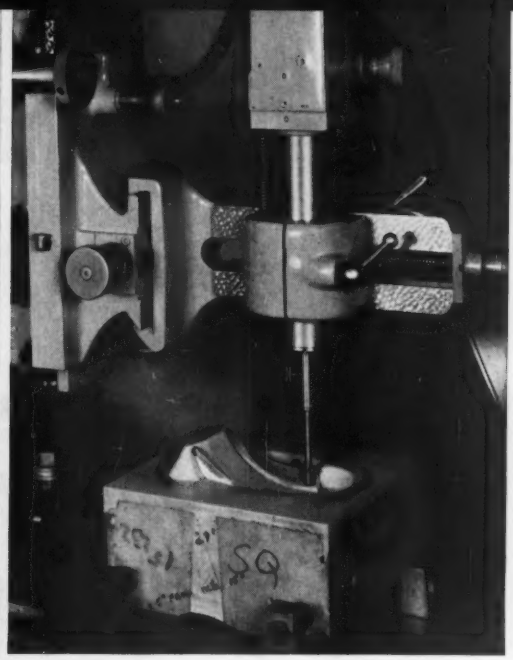

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Today's die sinking methods and machines greatly extend the possibilities of low-cost metalworking. For tracer controlled milling, ACRATRACE® tracing units perform the finest job of smooth, accurate duplication. These units are applied to several sizes and styles of Cincinnati Milling Machines, including the Contourmaster, a 1 hp medium size machine. Contourmasters are equipped in two ways: 1) with automatic depth control, for tracing contours in a vertical plane; 2) three-dimensional hand control, for tracing the extremes in dies and molds, such as shallow profiles or deep cavities, which can be speeded up through hand control tracing.

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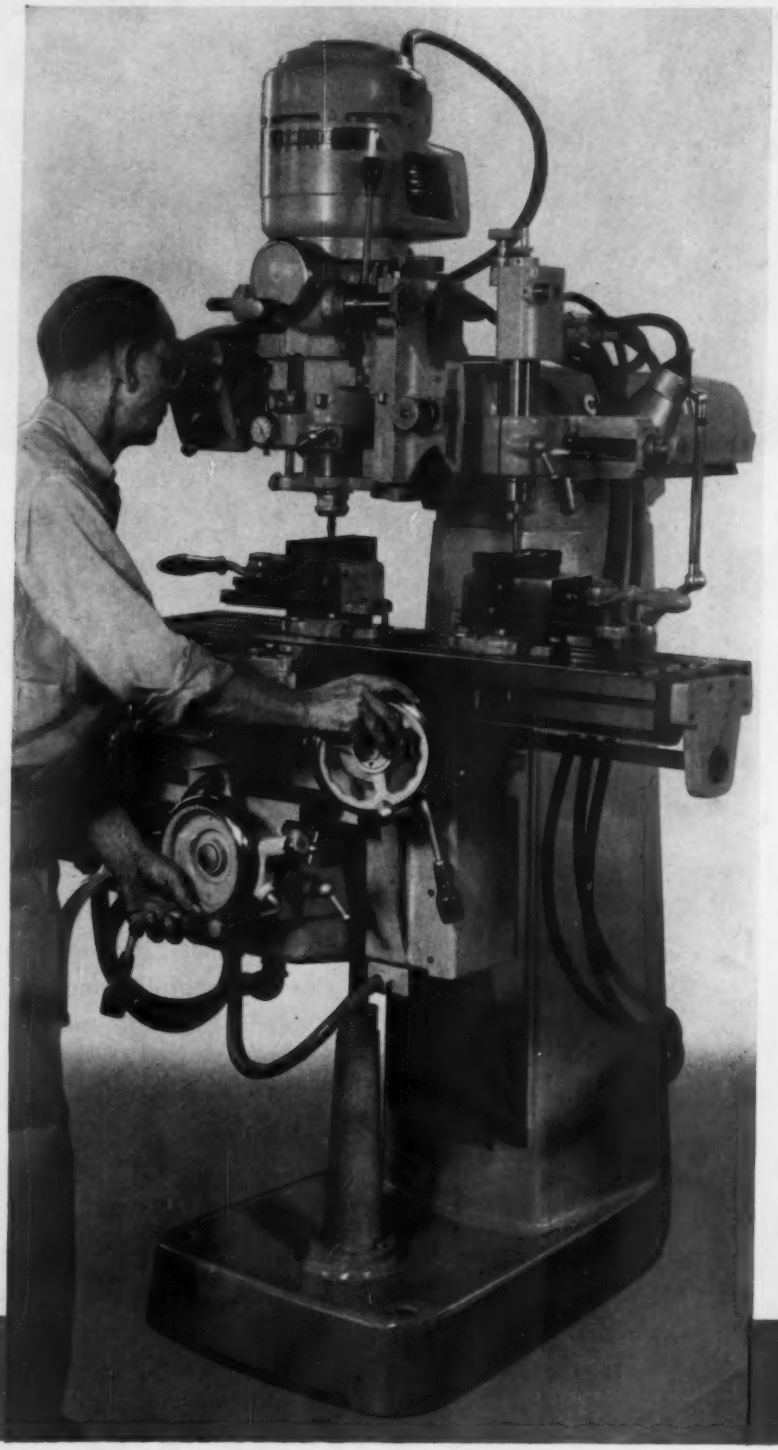

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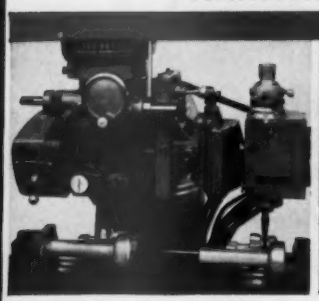
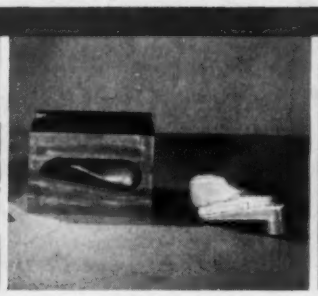
Contourmaster Milling Machines are available in 1A and 1B styles with automatic hydraulic depth tracer, and 1C style with three-dimensional tracer for hand 360° profiling and automatic and hand depth tracing. These machines and a wide variety of accessories and attachments are fully described in Catalog M-2164. Write or telephone for a copy. RE 1-2121.

CINCINNATI

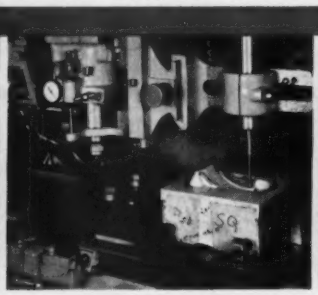
Contourmaster profit potential is evident in the variety of these setups and dies.



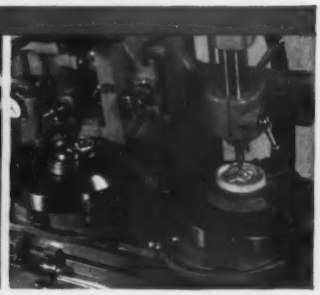
Prototype parts, such as this valve body, are milled quickly from bar stock. The 1C Contourmaster's 3-D hand tracing control does the trick.



Die casting die for vending machine lever, milled on a 1C Contourmaster. Narrow, deep cavities are milled easily with the light touch 3-D hand tracing control.



Light touch of the tracing finger does not damage the plaster master (right). Finished Contourmaster-milled die-casting die at left.



Automatic die sinking, employing Duplex Rotary Table Attachment on the 1B Contourmaster. Finished part (left) is a stamping punch.

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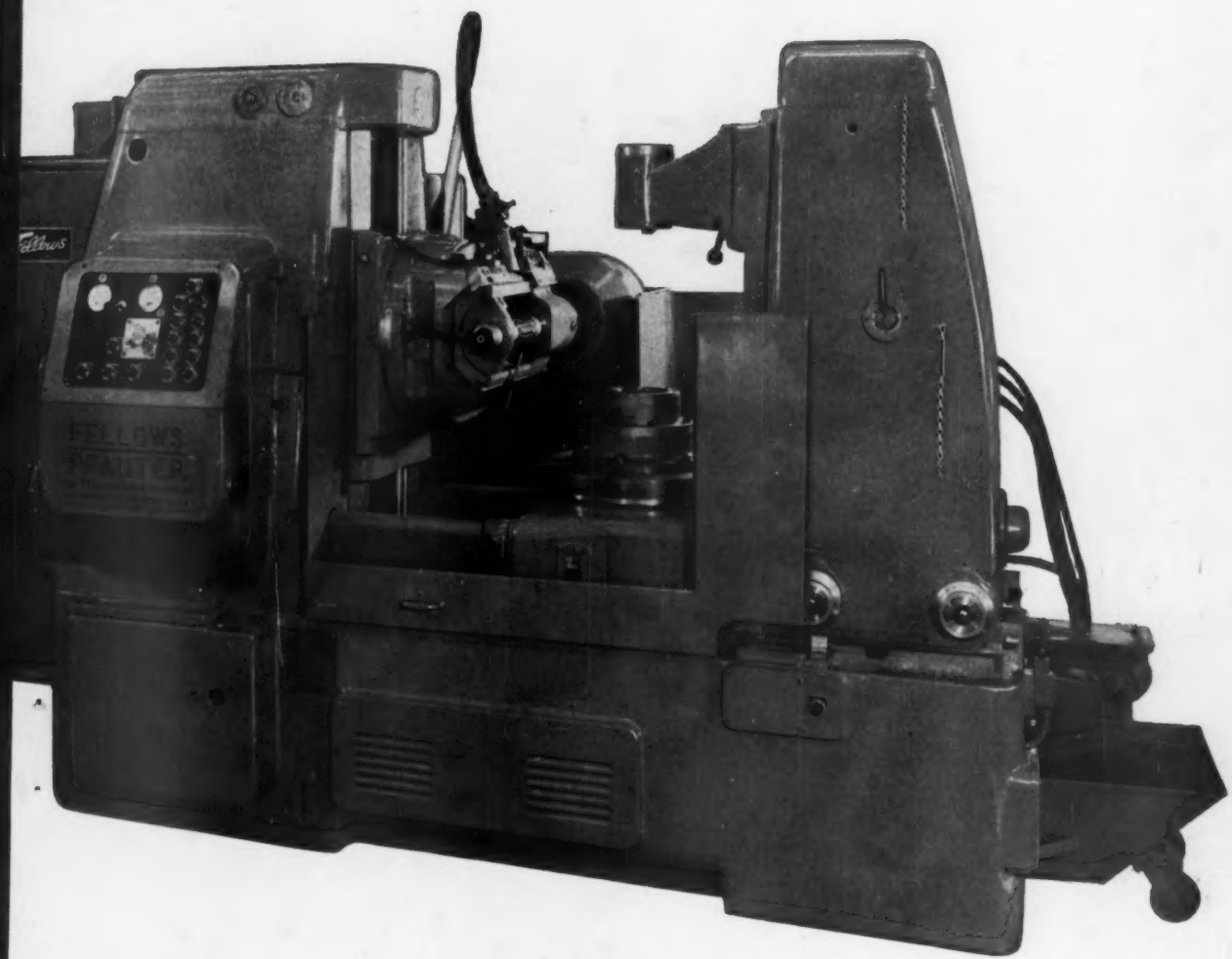

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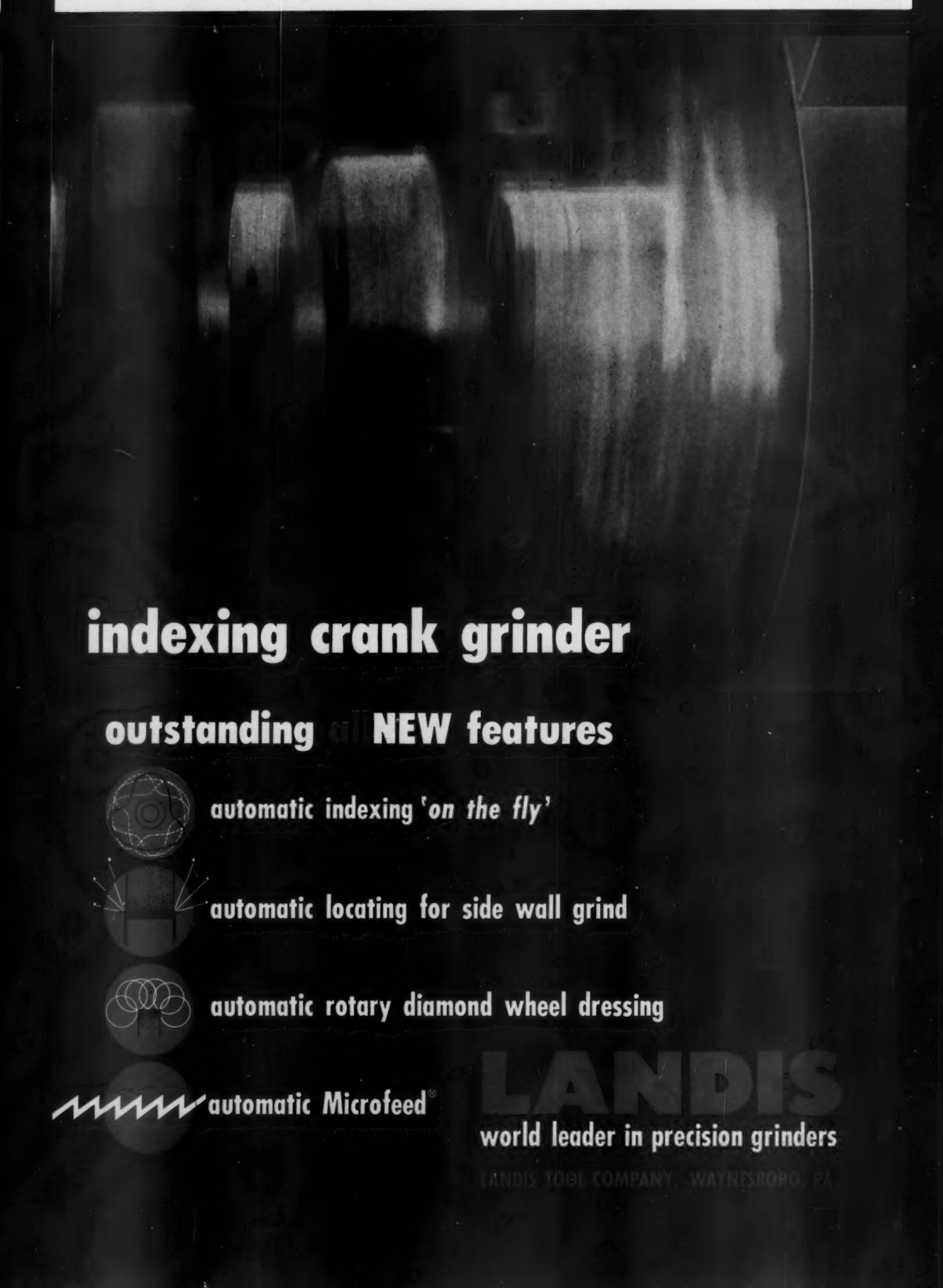
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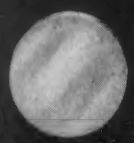
grinds two surfaces parallel in one operation

disc grinds parts like these

counter pinions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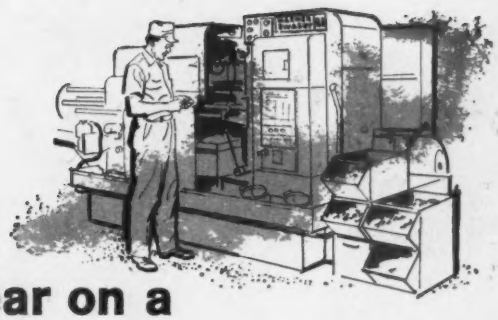
GARDNER MACHINE COMPANY, BELOIT, WISCONSIN
a subsidiary of Landis Tool Company

These sample parts give you an idea of the problems posed by Kimray's diverse and expanding product line. They range from simple to complex; leaded steel to stainless and other tough alloys. Tolerances are held to .001".

AT KIMRAY, INC.
Oklahoma City, Oklahoma



175 jobs set up in one year on a Warner & Swasey Multi-Spindle Bar Automatic

5-hour setups and only 50 hours downtime in 5 years of 2-shift operation allows Kimray to automate jobs under complex production conditions.

No changing of cams when setting tool slide strokes on the Warner & Swasey Multi-Spindle Bar Automatic. Easy-to-set "Stroke Quadrants" read directly in length of travel.

The rapid growth of Kimray's product line emphasized the need for organizing production and controlling inventory in producing a constantly growing variety of parts in small lots.

To cope with these problems, they installed a quick setup Warner & Swasey Multi-Spindle Bar Automatic. This machine is now producing their small lot work at automatic rates. Equivalent turret lathe production would have resulted in the need for exorbitant plant space, or if subcontracted, partial loss of control.

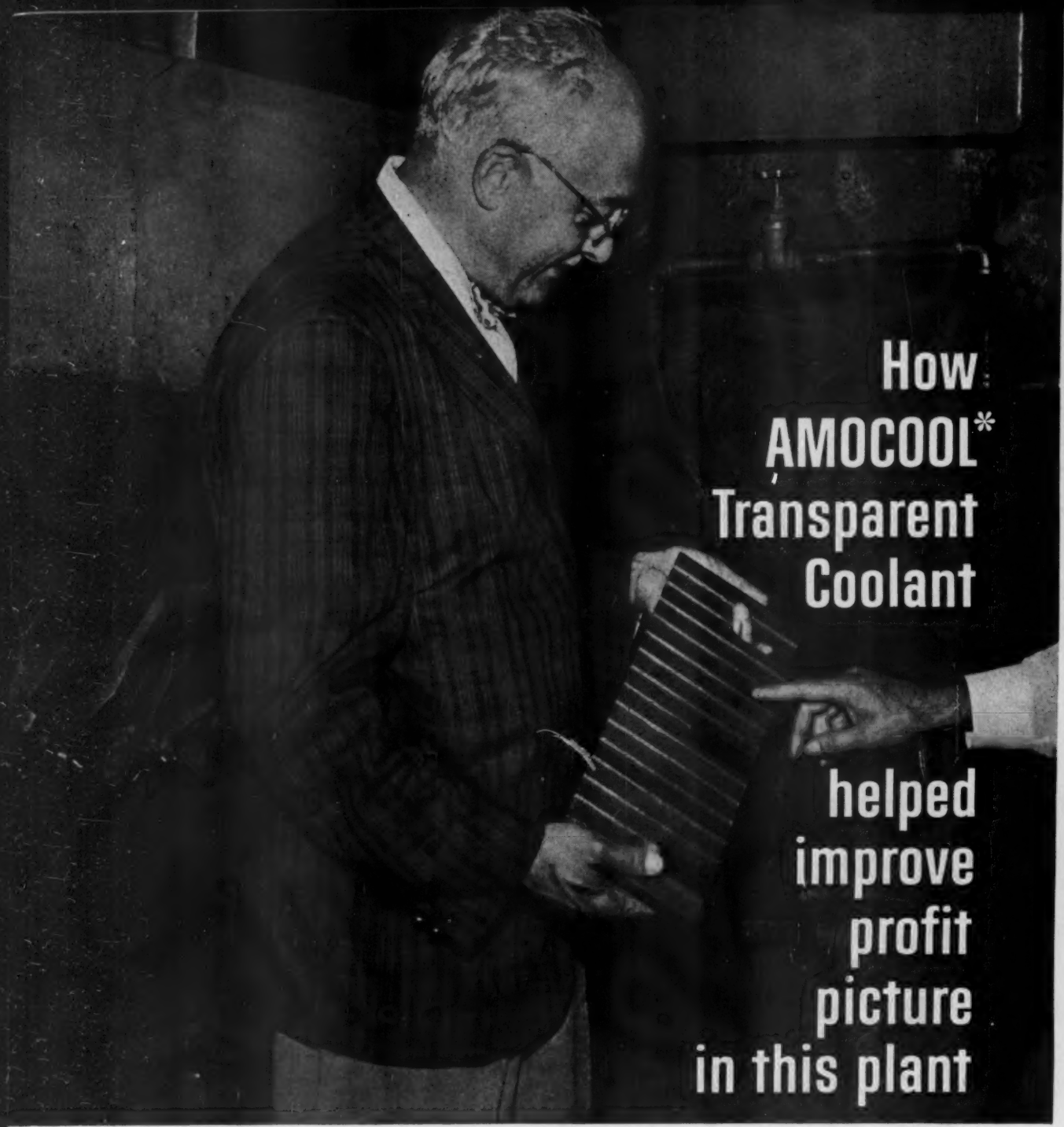
On Kimray's Warner & Swasey Automatic, average setup time is 5 hours; simple setups take 3 hours; complete change-overs, 6 hours. Since 1955, this machine has operated on a small lot basis, 88 hours a week; this is equivalent to 10 years of single shift production. Downtime for repairs has totaled only 50 hours. Fast, reliable performance of this kind allows them to automate as many as 175 jobs in one year.

Your Warner & Swasey Field Engineer can show you how Multi-Spindle Automatics are solving problems similar to yours. Warner & Swasey Company, Cleveland 3, Ohio.

YOU CAN TURN IT BETTER, FASTER,
FOR LESS...WITH A WARNER & SWASEY

WARNER & SWASEY

CIRCLE 264 READER SERVICE CARD



How AMOCOOL* Transparent Coolant helped improve profit picture in this plant

*Trademark

BY PAUL E. "PAPPY" STRATTON

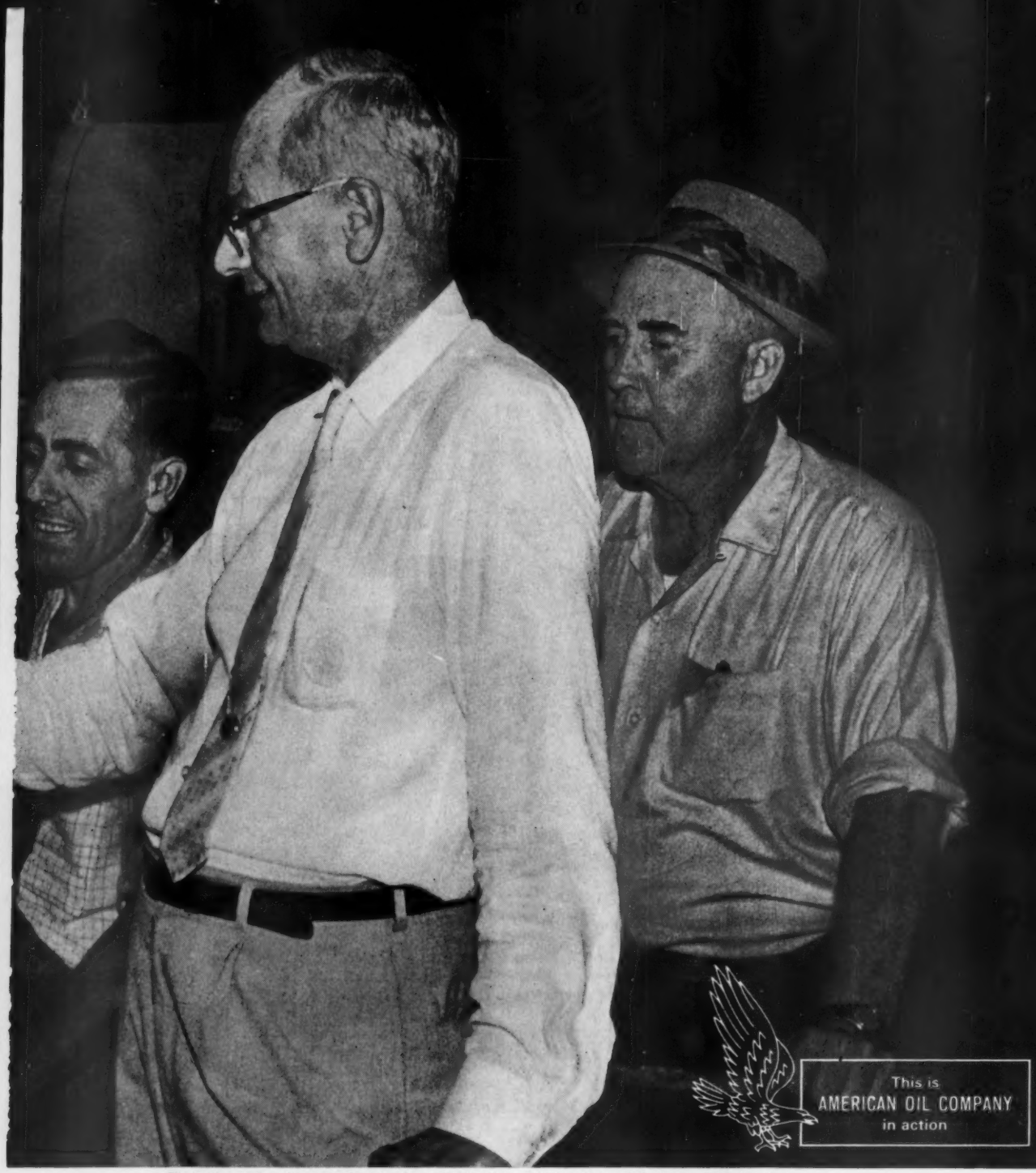
About the Author. "Pappy" Stratton has been providing technical help on lubrication and metalworking problems to customers in the Detroit area for nearly all of the twenty-five years he has been working for the company. In addition to having this store of practical experience to help him, Pappy has completed the Company's Sales Engineering School.

* * *

By using a soap-base grinding compound, Detroit Edge Tool Company was getting excessive corrosion and rust on work and grinding machines. Oil vapor was collecting on machines and on the ceiling, causing dirty working conditions. Most important, high wheel loading was causing frequent down-time for wheel dressings.

We worked out a test program on AMOCOOL Transparent Coolant with the management. On our first test on one surface grinder, feed pressure was cut substantially while at the same time metal removal was increased.

CIRCLE 265 READER SERVICE CARD



Eliminate reworking because of rust, reduce wheel loading and extend intervals between wheel dressings; do these and you increase profit per unit, explains Detroit Edge Tool president, Dan Ebbing, to P. E. "Pappy" Stratton of American Oil. Plant manager, John Yonker (right) and Sam Vineh, operator, look on.

The cost of reworking parts to remove rust was eliminated. Time required to clean machines to get rid of the odor was cut in half. Less wheel loading and fewer wheel dressings have upped production and reduced costs. Our test program paid out in an improved profit picture. All grinding and drilling equipment has been converted to AMOCOOL Transparent Coolant.

* * *

Would you like this kind of technical help to assist you in improving profits? Get it by calling the American Oil Company office nearest you.

Quick facts about
AMOCOOL
Transparent Coolant

- Clear, transparent fluid
- Controls corrosion on work and machines
- All chemical. Does not support bacteria growth
- Unaffected by humidity
- Fire resistant.
- Odorless

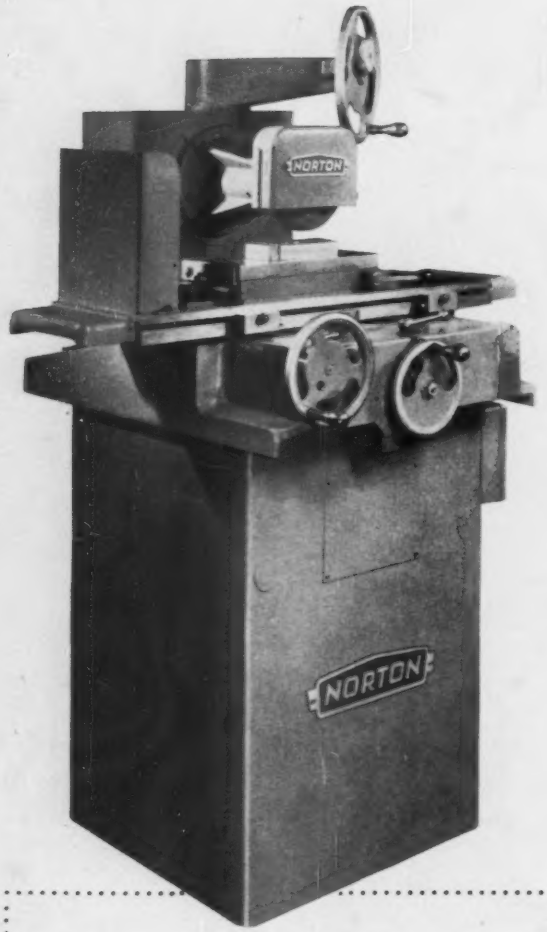
AMERICAN

AMERICAN OIL COMPANY
910 South Michigan Avenue
Chicago 80, Illinois

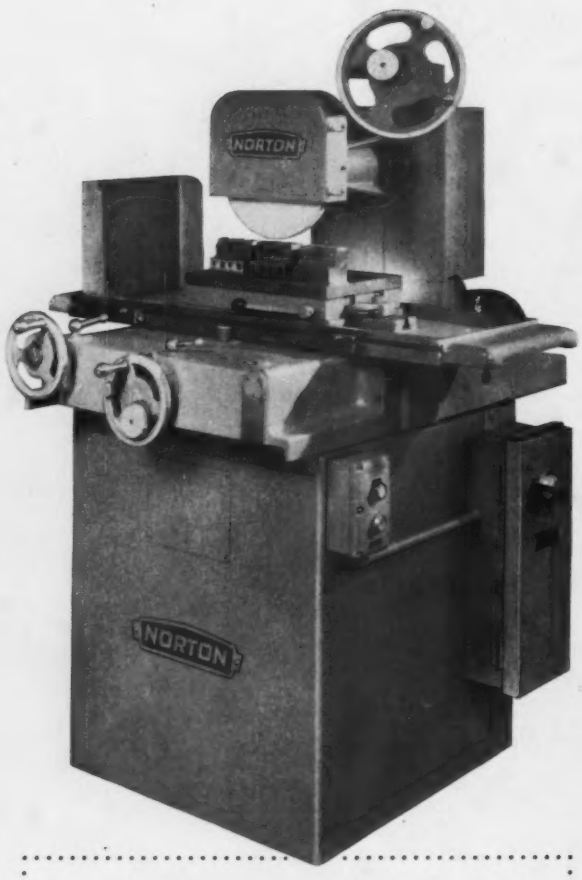
CIRCLE 266 READER SERVICE CARD

Announcing

New Norton Hand



NORTON 6 x 12" Type TS Hand Surface Grinder Table travel up to 14". Cross traverse up to 7". Maximum height capacity 12½"*. Grinding wheel, 7" x ¾" x 1¼". Table traverse by hand through positive cable drive. One revolution of hand wheel moves table 6⅝", on friction-free ways.



NORTON 10 x 16" Type TS Hand Surface Grinder Table travel up to 18", cross traverse to 11", grinding wheel 12" dia. Extended wheel head ways assure maximum grinding support and full use of 12" vertical* capacity. Two-speed wheel drive. Fine cross-feed increments of .0005".

*Table top to bottom of full size grinding wheel.

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Surface Grinders....

Latest Norton developments...
simplified, rugged, versatile...
are welcome cost-cutters
for your daily toolroom jobs.

Like all Norton grinders — from highly complicated automatic production machines to simpler toolroom types — the new TS Type Hand Surface Grinders have the common denominator of *precision performance, easy operation* and *long service life,* built into them as follows:

Precision Performance. Two-speed wheel feed hand wheel has graduations of .0005″ for fast, accurate positioning, plus a vernier scale graduated .0001″ for precise grinding feeds. Rigid and long vertical slide and saddle design provide maximum support for moving parts, resulting in reduced vibration and better finish. Accuracy of center-guide cross feed is excellent for groove and shoulder grinding.

Easy Operation. Controls are at working height, for fatigue-free table and cross feed operation. Antifriction bearings under the table produce a smooth and easy motion for reduced effort. Table and cross slide controlled by hand wheels with no levers requiring crossed-arm operation when motions are simultaneous. These grinders are the only machines of their type with hinged wheel guard for quick wheel change.

Long Life. Anti-friction spindle is mounted in housing for rigid, rugged strength. Long vertical slide ways eliminate wheel "hang up" tendencies and provide large way areas. Deep saddle eliminates rocking, gives strong support for grind. Antifriction rollers cut wear on table and cross slide.

Over-all economy of NORTON TS Hand Surface Grinders is strengthened by many features such as their uncomplicated, accessible mechanisms and clean, uncluttered design which reduce maintenance costs. For details on how these new NORTON developments can cut your own daily grinding costs, see your Norton Man, a Trained Grinding Engineer. Or write to NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. *District Offices:* Worcester, Hartford, Chicago, Detroit, Cleveland.

In Canada: J. H. Ryder Machinery Co., Ltd.. Toronto 5.

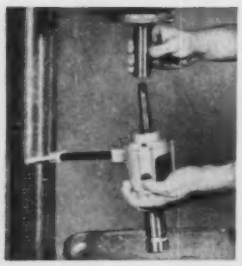
NORTON
MACHINE TOOLS

75 years of . . . **Making better products . . . to make your products better**

MACHINE TOOL DIVISION: Grinding and Lapping Machines — **G & E DIVISION:** Shapers • Gear Cutting Machines • Gear Induction Hardeners

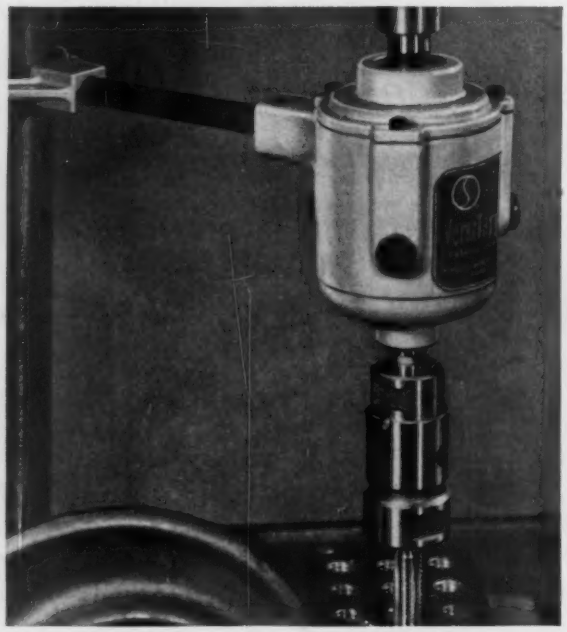
IT'S A FACT!

You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.

Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-½"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press . . . features half-inch capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER...

operates easily in any material
. . . with widest capacity range
. . . yet costs far less

JUST $63 COMPLETE

The *new* VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to ½", but depending on application, use of taps smaller than No. 10 is limited. It develops *more power*—makes the tapping of ½"-13 holes a simpler matter, even with light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of $63.00 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon.

Supreme PRODUCTS CORPORATION

2222 S. CALUMET AVENUE • CHICAGO 16, ILLINOIS

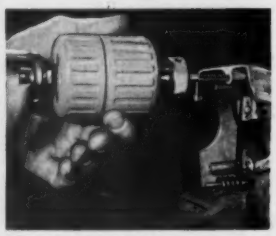
You get more from power tools with Top Quality Supreme Accessories

Supreme Brand Chucks

Noted for unmatched quality. The widest range of sizes and types...one for every machine in your shop. Exclusive Supreme hardening means greater accuracy—longer wear.

Supreme Versamatic

Reversible speed reducer for portable drills. Fits all makes —permits their use for power screw driving, nut running and heavy duty drilling. 7 to 1 reduction means high torque increase. *A fine tool.*



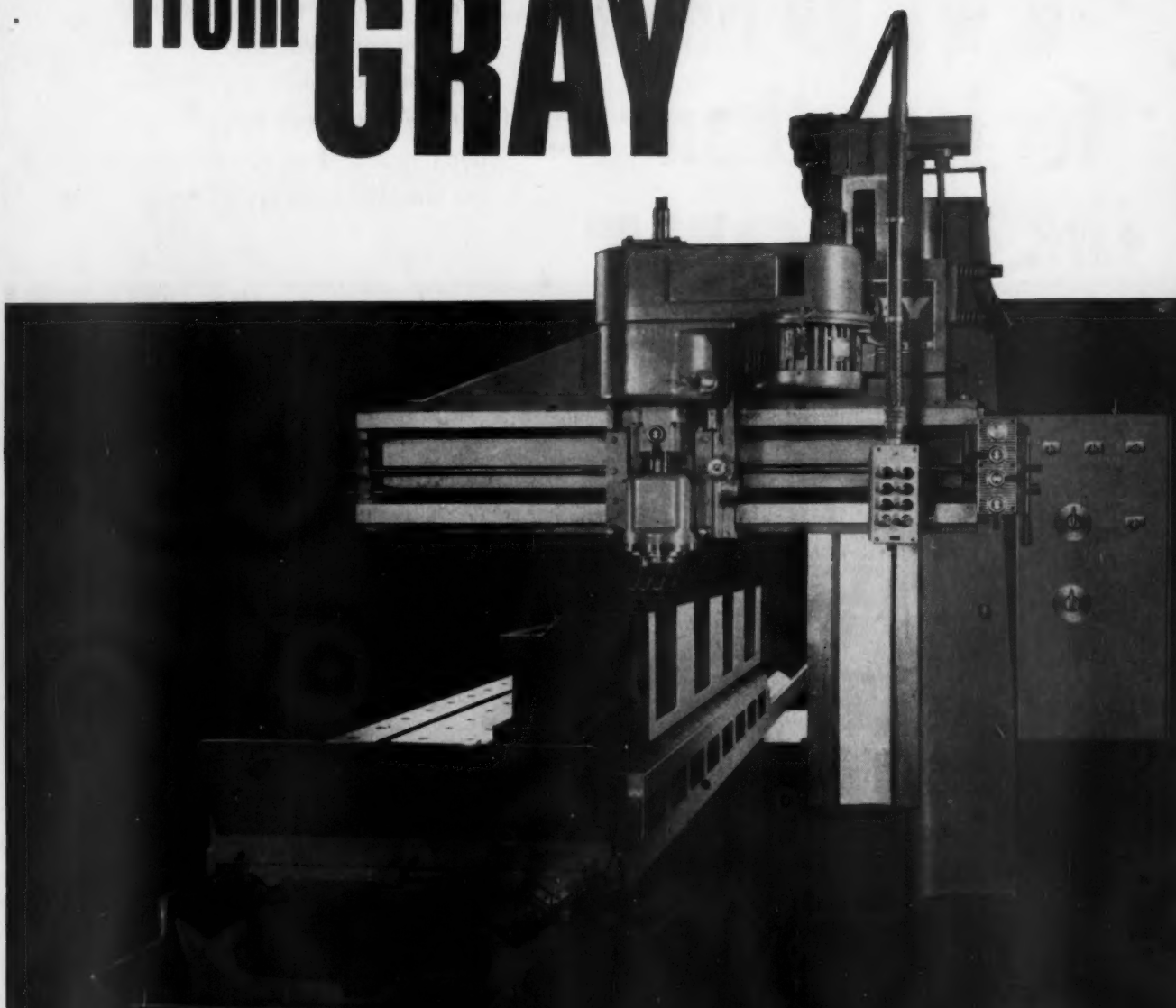
Supreme Push-Pull Tapper

Like the Versamatic, but made for the single purpose of tapping with portable drills. Reverses instantly for tap removal. Handles taps up to 5/16" diameter. Top quality. Simple to operate.

SUPREME PRODUCTS ARE IN STOCK IN YOUR CITY. CALL YOUR DISTRIBUTOR

PRECISION ASR PRODUCTS

NEW budget class miller from GRAY

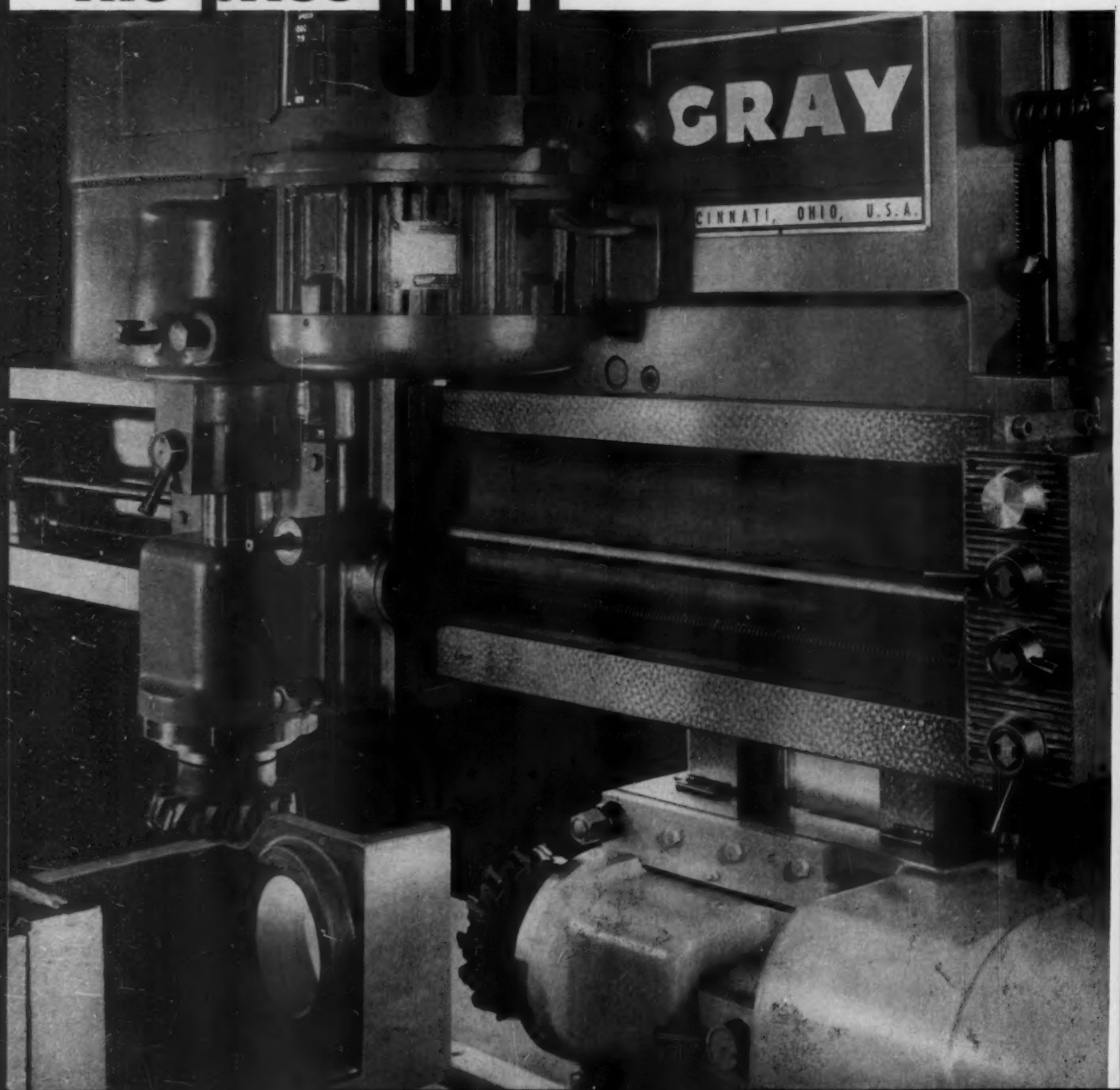


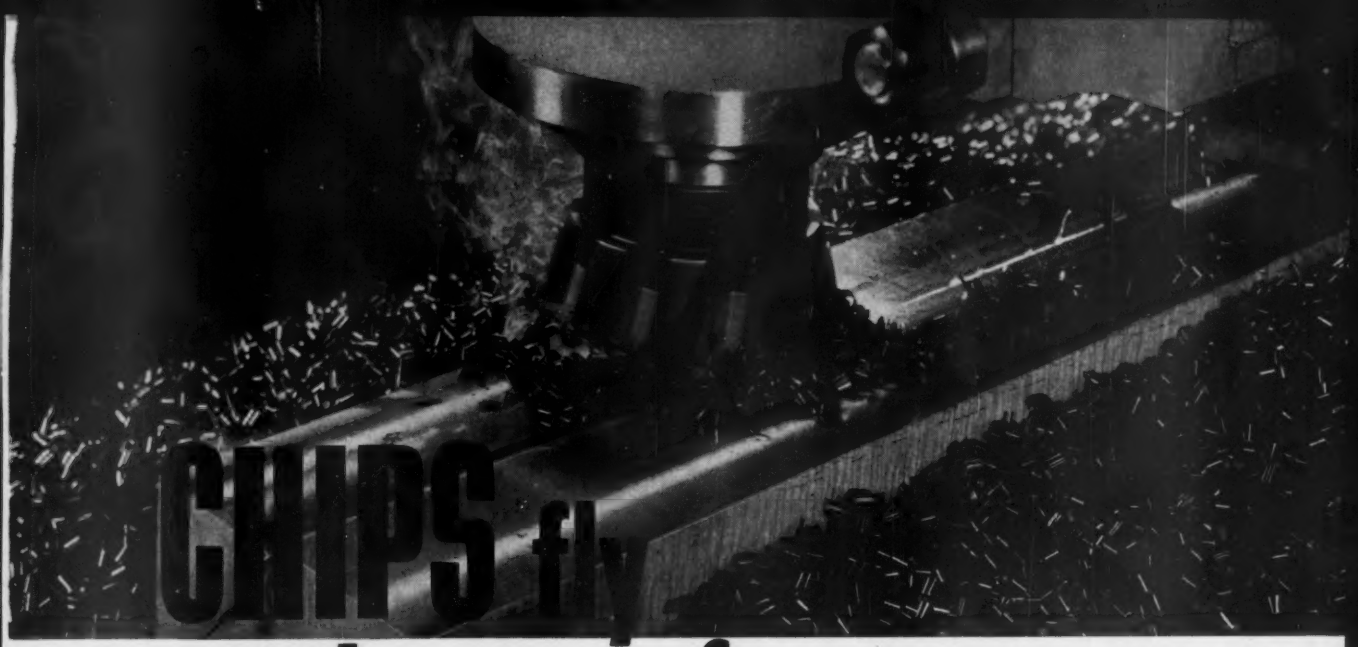
$33,700.00

ONE RAIL HEAD
30" X 6' TABLE

TWO heads for less than the price ONE

Most milling machines built with one spindle, cost more than the new Gray Handymill equipped with two spindles. Why ever consider high priced single spindle machines with fancy controls you don't need, when you can enjoy the low priced, versatile Gray.

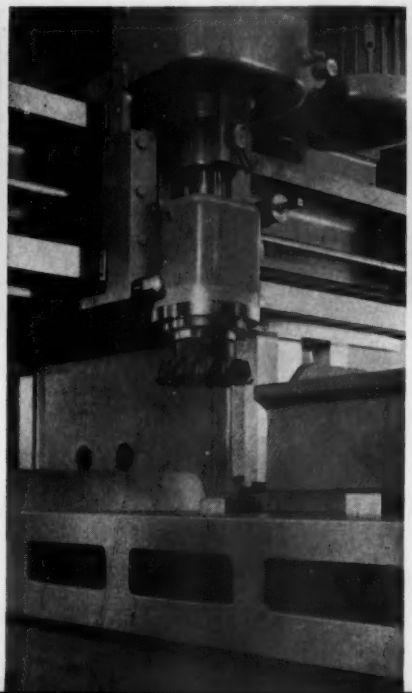


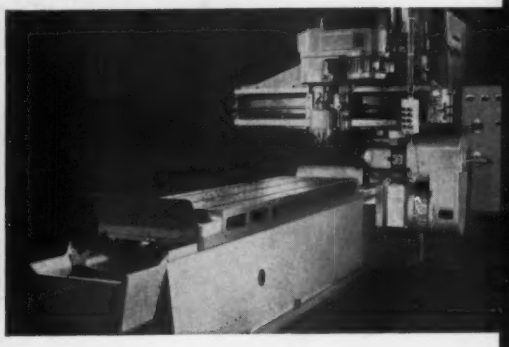


CHIPS fly at the rate of 4½ lbs. per minute

An outstanding performance, proof positive that the Gray Handymill has power to spare. Maximum chip removal, versatility, low burden factor minimum maintenance, all at the fabulously low price of $33,700—(basic machine, one head) makes the Gray Handymill your best investment.

SOLID GRAY CONSTRUCTION THROUGHOUT





Technical Bulletin No. 77R Available

THE G. A. GRAY CO.

CINCINNATI 7, OHIO

MILLING MACHINES-PLANER TYPE/MILLING PLANERS/PLANERS/ HORIZONTAL MILLING, BORING AND DRILLING MACHINES

CIRCLE 272 READER SERVICE CARD

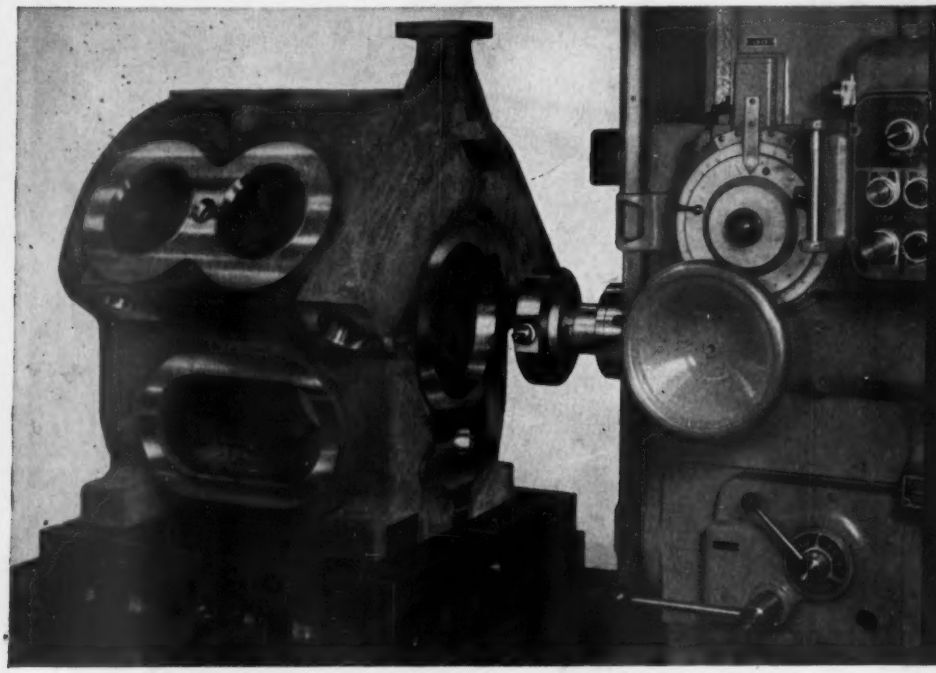
Gone to Fair street...

DE VLIEG MACHINE COMPANY, FAIR STREET • ROYAL OAK, MICHIGAN

Why did he drop everything and go? Because he couldn't afford not to. He had just received a very remarkable report on the DeVlieg JIGMIL and the DeVlieg Philosophy of Precision Machining. He's got to find out whether such tremendous cost-saving performance can really be true. If there's a better way of doing things, he wants to know about it . . . put it to work for his company. That's one reason why his company is so healthy . . . so far ahead of competition.

SOME OF OUR JIGMIL USERS

ACF Industries, Inc.
Allis-Chalmers Mfg. Co.
Alfring-Landers Co. Inc.
Bell & Gossett
Bethlehem Steel Corp.
Brunner Corp.
Caterpillar Tractor Co.
Champlain Corp.
DeLaval Co.
The Deming Co.
Didde-Glaser, Inc.
Franklin Machine Co.
Gardner-Denver Co.
Harnischfeger Corp.
Hupp Aviation Co.
Hyster Co.
Ingersoll-Rand Corp.
International Harvester Co.
Koppers Co.



Basic Principles in the DeVlieg Philosophy of Precision Machining

- A Machine Tool capable of desired accuracies
- Correct Tool Geometry
- A Method of Tool Preparation and Maintenance

Only DeVlieg Delivers the Complete Package!

Seeing is believing. Compressor housing for an industrial air conditioning system being machined on a DeVlieg Spiramatic JIGMIL. Accurate holes and flat surfaces are extremely critical in the part to prevent leakage of Freon gas. Part is programmed on a model 3B-48 standard JIGMIL with 26" x 26" index table and Microbore tooling. Machining operations include complete rough and finish milling and boring in three set-ups of the part. The DeVlieg system provides a finished part in approximately five hours. Much faster than machining methods previously used!

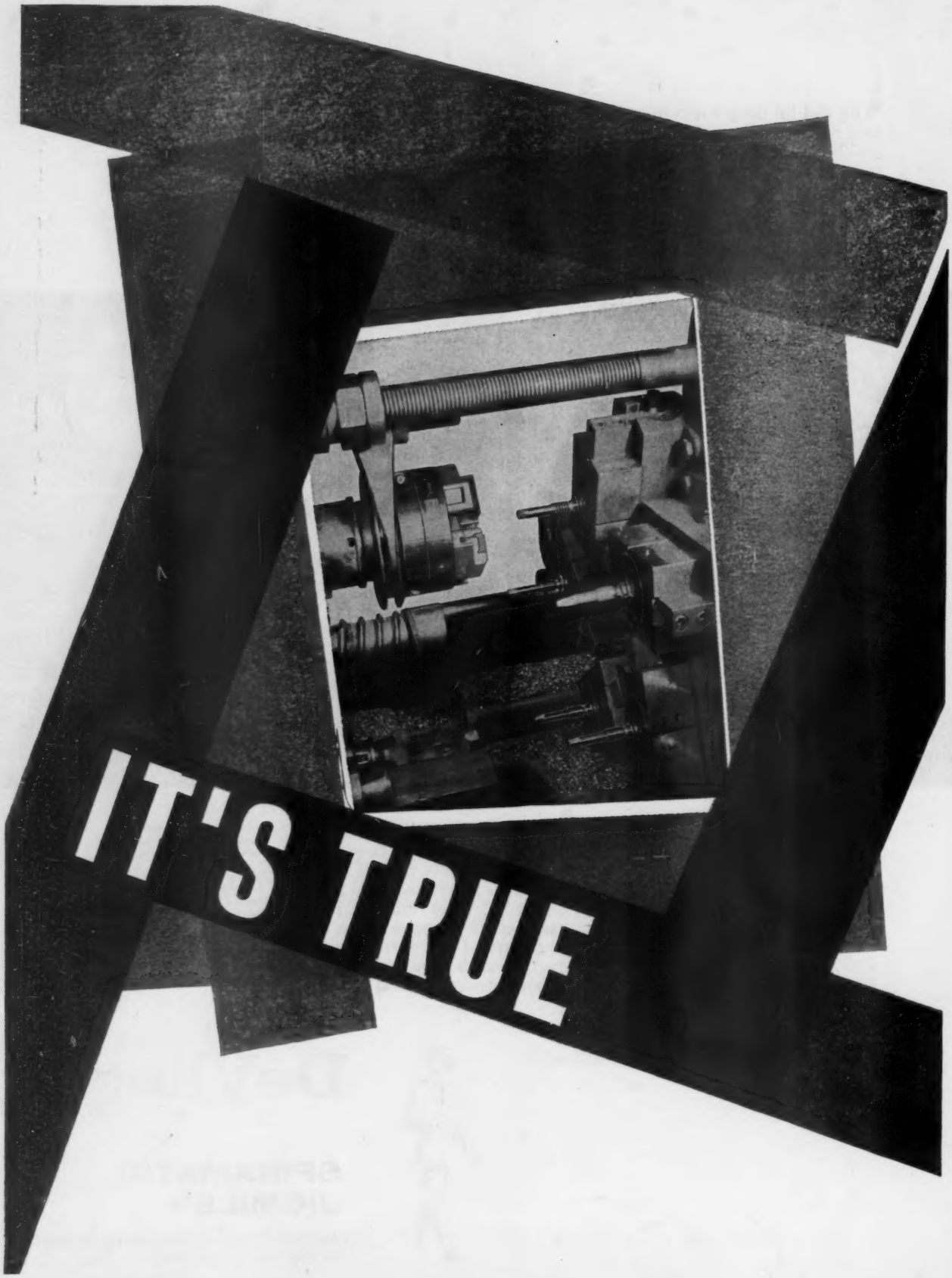
Ladish Co.
F. Joseph Lamb Co.
LeTourneau-Westinghouse Corp.
J. Leukart Machine Co., Inc.
Manning, Maxwell & Moore, Inc.
Maro Precision Tool Co.
National Supply Co.
New Jersey Machine Corp.
Practical Machine Co.
Saco-Lowell Shops
Sandia Corp.
Union Carbide Nuclear Co.
Van Vlaanderen Machine Co.
York Div., Borg-Warner Corp.
Worthington Corp.

WILL YOU BE THE NEXT TO VISIT FAIR STREET

DeVlieg

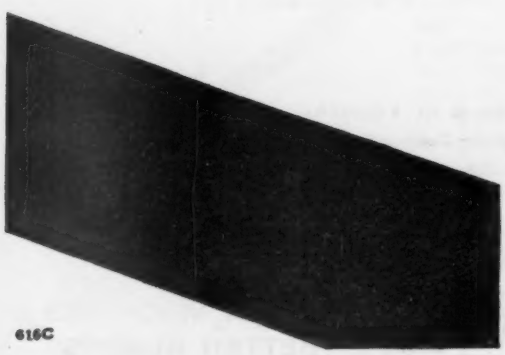
SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS


IT'S TRUE

acme threads produced at 900 R.P.M.

TRUE! A LANDIS LANDEX Heat-Treated Die Head is producing Modified Acme threads on valve stems at the rate of 900 R. P. M. at the Sterling Brass Company, Cleveland, Ohio. ■ .570" diameter, 1/8" pitch—1/4" lead modified Acme threads, 3/4" long are cut on cast brass by the model 10JN 1 1/4" LANDEX Head—mounted on a 6" x 6 3/4" Goss and De Leeuw Automatic Chucking Machine in third position. Besides the outstanding cutting speed, the efficiency of the LANDEX Head is further brought out by the fact that a 30° short throat chaser is used and threading is close to a shoulder. 300 pieces are produced per hour and an above average chaser life of 5000 pieces between grinds is achieved. ■ Naturally, the 900 R.P.M. cutting speed saves time and reduces the overall cutting cost considerably. Thread finish is excellent, adding to the more than satisfactory performance of the LANDEX Head. ■ LANDEX Die Heads can give this kind of positive performance in your plant too. They are designed for application to bar automatics and other "live" spindle machines, and have ample head rigidity to allow for a long life and high quality thread production. They offer low initial cost, permit rapid set-up, give trouble-free operation, and are easy to adjust. LANDEX Heat-Treated JN Heads are available in four sizes for threading all diameters from #4 to 2".



616C

LANDIS *Machine* COMPANY WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

Problem:

One Straight Cut... *One Miter Cut*

Solution:

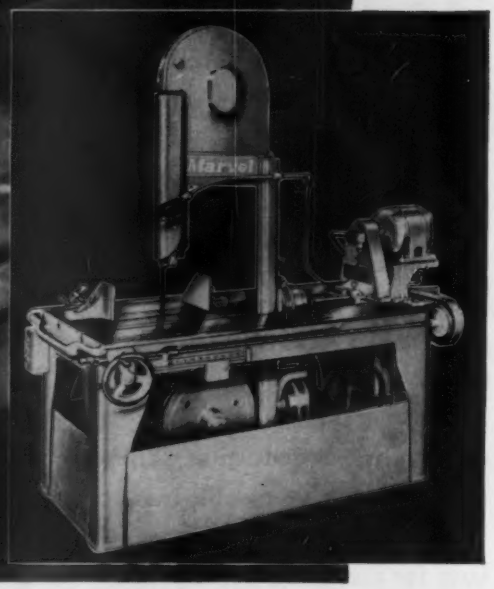
One MARVEL No. 8 Band Saw

Recently, a MARVEL Field Engineer was called on to help solve a troublesome production sawing operation.

He found that a straight cut and a 45° miter cut were required on a 10" diameter pipe prior to welding it into an assembly. Production was slow, cutting costs were climbing to alarming proportions, and too many pieces were being rejected because one or both cuts were not meeting accuracy standards.

The trouble was easy to find. A makeshift arrangement was being used to do the job. After the straight cut was made, the miter was laid out and the pipe swung out into the aisle so that the saw could make the angle cut. Excessive work handling slowed production, valuable floor space was taken up, and accuracy became increasingly difficult to maintain.

Recommending a MARVEL No. 8 Universal Band Saw solved the problem. When the MARVEL Field Engineer showed how the Saw's column and blade can be tilted up to 45° right or left of vertical and fed straight into and through the cut at the pre-determined angle *while the work remained stationary on the table*, the production superintendent recognized the answer to his problem. He also saw, how the built-in protractor would eliminate all layout.



Result: another MARVEL No. 8 Universal Band Saw went to work for a new user.

Cutting miters quickly and accurately is just one of a hundred jobs that can be done on the versatile No. 8 Universal Band Saw ...the most useful—and used—metal cutting saw on the market. Get complete information on this time and cost saving band saw today. Write for Catalog 875.

Marvel No. 8 Universal Metal Cutting Band Saw
Capacity: 18" x 18"

MARVEL *Metal Cutting* **SAWS**

BETTER MACHINES
BETTER BLADES

ARMSTRONG-BLUM MANUFACTURING CO. • 5700 Bloomingdale Avenue • Chicago 39, Illinois

how to improve your turning methods with

SUNDSTRAND *"ENGINEERED PRODUCTION"*

The Sundstrand "Engineered Production" approach to your turning requirements guarantees you maximum productivity per dollar of machine investment.

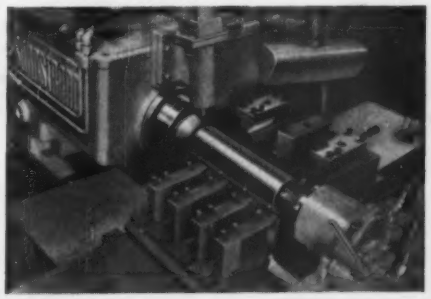
Sundstrand engineers first evaluate your production requirements, then provide the machine and tooling that give you the most economical production possible. Initial investment, present and future work requirements, workhandling, floor-to-floor time, tooling requirements, and other factors all are taken into full consideration to assure you lowest possible cost per piecepart.

Often a standard Sundstrand automatic or tracer lathe is the best machine for the job. Or the greatest production efficiency may be secured by adding special tooling, automatic loading, special cycling controls, or other accessories to standard machines. Where production warrants, completely special machines may be the most economical answer.

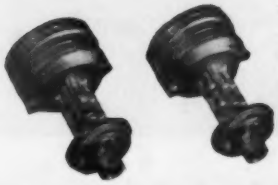
To discover the opportunities for more production profits in your shop, ask us about a Sundstrand "Engineered Production" analysis of your turning operations.

1 SMALL-LOT TURNING

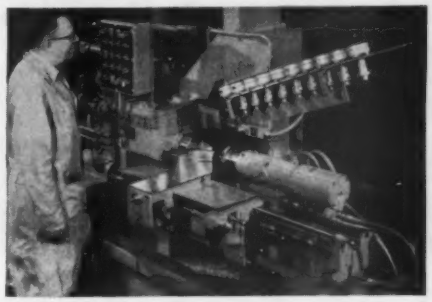
Production increased from 30 to 106 pieces per hour — in turning one of various plungers and liners when the job was put on this Model 8A lathe. Comparable savings were realized on the 12 different sizes of parts machined on this lathe. Simplicity of set-up makes Sundstrand multi-tool lathes practical for small lot sizes.



2 LONG-RUN TURNING

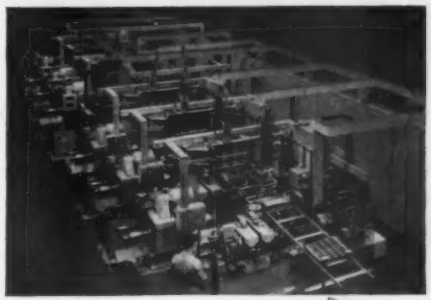


These die-cast aluminum housings are produced at a rate of 420 pieces per hour on this Sundstrand automatic lathe. Operations include turning the locating diameter and facing the flange. This standard machine has a completely automatic cycle that includes part-loading from a hopper and ejection of the finished workpiece.



3 SPECIAL TURNING

Sundstrand experience can make a big difference, both in initial investment and machining cost per piece, when large volume production dictates the use of special turning equipment. Here in continuous automatic cycles, camshafts are loaded, unloaded and transferred through this 8-lathe line at more than 200 parts per hour.



SUNDSTRAND

SUNDSTRAND MACHINE TOOL

BELVIDERE, ILLINOIS

Division of SUNDSTRAND CORPORATION

Get the facts on how improved machines and methods based on Sundstrand "Engineered Production" evaluations can reduce your turning costs. Write today for Bulletin 131.

◄ CIRCLE 277 READER SERVICE CARD

CIRCLE 278 READER SERVICE CARD

Drilling? Boring? Seize Your Numerical Control Advantage

Buy no new jigs and fixtures. Convert storeroom space for useful work. Cut down heavy inventory investment. Tape control is taking over.

More than 500 hours and $5,300 went into making that obsolete drill jig in the foreground. It was used one year. You could make a tape to do the same work for $50, store it in an envelope, revise it for model changes in 20 minutes.

For low volume drilling, milling, turning, and a host of other metalworking operations, there just isn't any other way to beat the cost-cutting ability of numerical control.

Before making new drilling and boring fixtures, write for the bulletin "FPB" describing Fosdick's numerically controlled precision boring and jig grinding machines. Write for bulletin "FTD" describing the 32-spindle Fosmatic Turret Drill. It's time to "get a proposal from Fosdick!"

Write for bulletin "FPB"

Write for bulletin "FTD"

FOSDICK

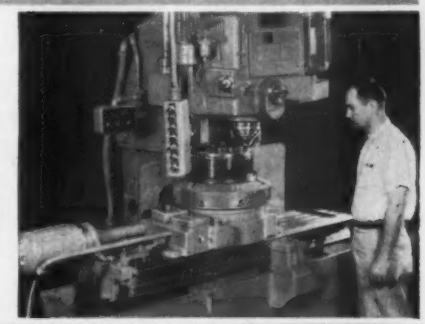
The Fosdick Machine Tool Company
Cincinnati 23, Ohio

how to improve your milling methods with SUNDSTRAND "ENGINEERED PRODUCTION"

The design of a machine can be a production handicap if it can't be adapted to the production method. With Sundstrand "Engineered Production," method design comes first, machine design second. Rather than try to fit existing machine designs into milling methods, our engineers first determine the most economical milling method. They then apply the most economical machine design to suit this method. In some cases, standard Rigidmils suit the job at hand. In others, Rigidmils of unit construction are rearranged and modified to suit the method. Where neither of these are applicable, our engineers design entirely special machines for the job. Here are specific examples of each.

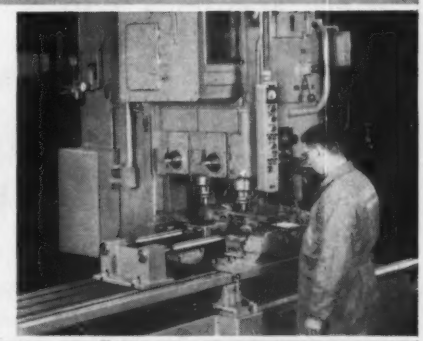
1 Standard Rigidmils with fixtures and tooling to suit your work

This vertical Rigidmil with standard automatic index base attachment reduced machining time 82% in milling 28 scallops on the periphery of a steel housing. The cycle is fully automatic including indexing. The operator simply loads and unloads the work-holding fixture. The index base can be easily removed so that this standard machine can be used for other work.

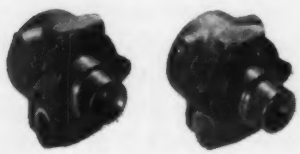


2 Rigidmils with special heads and tooling

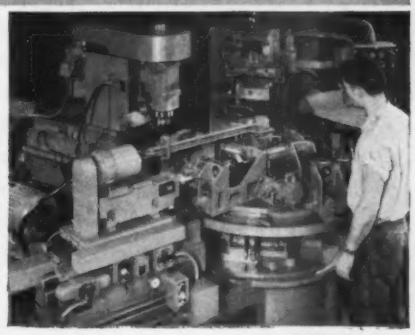
Machining time for keyway milling operations on various shafts was reduced an average of 30% by this two-spindle Sundstrand vertical Rigidmil, milling 2 keyways at a time. Two shafts are clamped side by side in the special fixture, quickly adjustable to handle a wide range of sizes. The number of keyways varies from 1 to 5 per shaft with lot sizes ranging from 50 to 200 pieces.



3 Entirely special machines



This special Sundstrand machine indexes pump bodies thru 5 stations to bore the ID, mill top pad, stamp milled pad, wash, brush and blow out all holes and the inside. All stations operate in automatic cycles simultaneously as operator unloads and reloads. Production of 200 parts per hour with this machine and 1 operator formerly required 4 machines and 4 operators.



SUNDSTRAND MACHINE TOOL
BELVIDERE, ILLINOIS
Division of SUNDSTRAND CORPORATION

Milling machines that give you maximum productivity for your machine tool dollar are described in Sundstrand Bulletin 131. Write for your copy today.

You can turn a profit on a New Britain +GF+ Copying Lathe

Here's a birdseye view of a New Britain +GF+ Copying Lathe. It shows some important differences between this machine and conventional lathes with copying attachments. The point here is this—*the most effective use of the single-tool copy-turning principle can be made only with a machine designed from the ground up for this type of work.* The New Britain +GF+ is just such a machine. Notice the chip pan. It's big (it has to be) and located for easy removal of chips from the back of the machine. The design of the work area allows for unobstructed free-fall of chips out of the way and into the pan.

The New Britain +GF+ is massive and rugged, with plenty of power—up to 40 h.p., if you need it. It's simple to operate, quick to set up and change over. The single-point tool can be changed in one minute and it out-produces gang tooling setups in the bargain. Turning is controlled by either a template or a prototype. External and internal copying are accomplished in one set-up with special tooling.

The possibilities for short or long run chucked and between centers work on the +GF+ are wide and varied. Because the work is produced with good surface finish and dimensional accuracy, grinding can be reduced and, in some instances, eliminated. Large diameters are broken down economically by successive parallel cuts, automatically if desired, with optional two-cut or multi-cut recycling.

You've got to see one of these machines in action to fully understand the kind and quantity of work they are capable of producing. Contact your New Britain Representative for demonstration arrangements or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

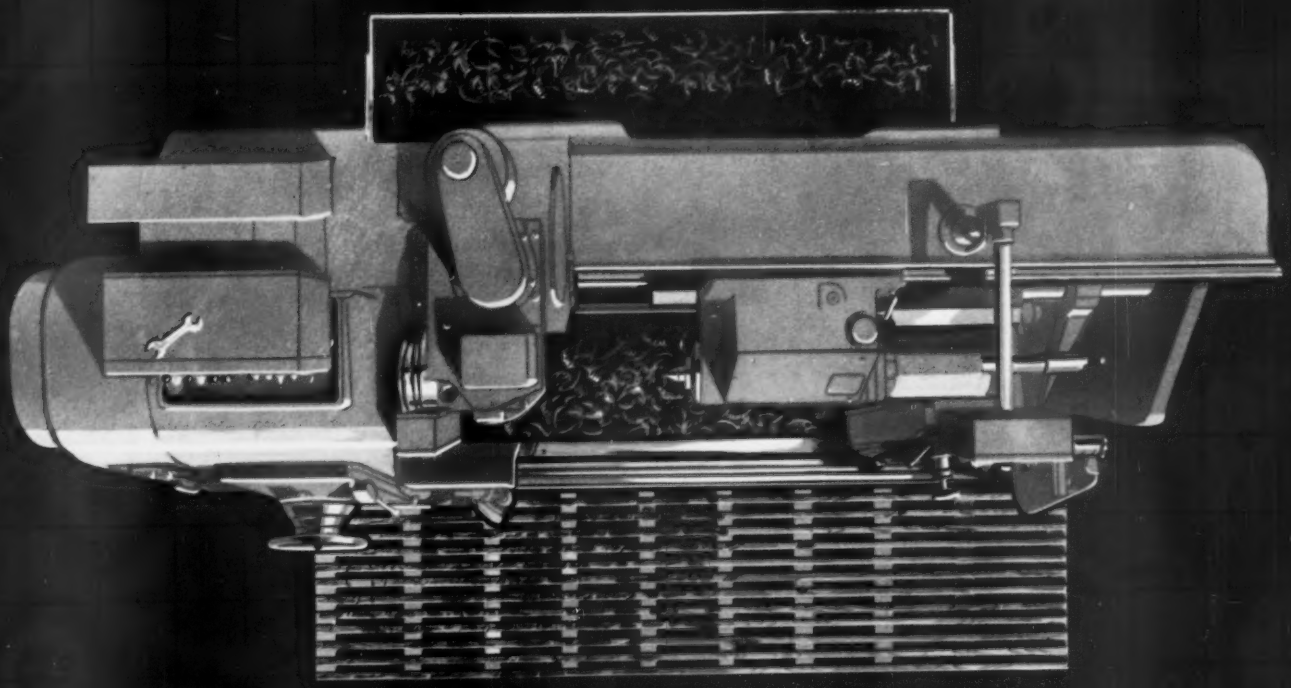
NEW BRITAIN • GRIDLEY MACHINE DIVISION

Unlimited tooling combinations with New Britain Bar Machines

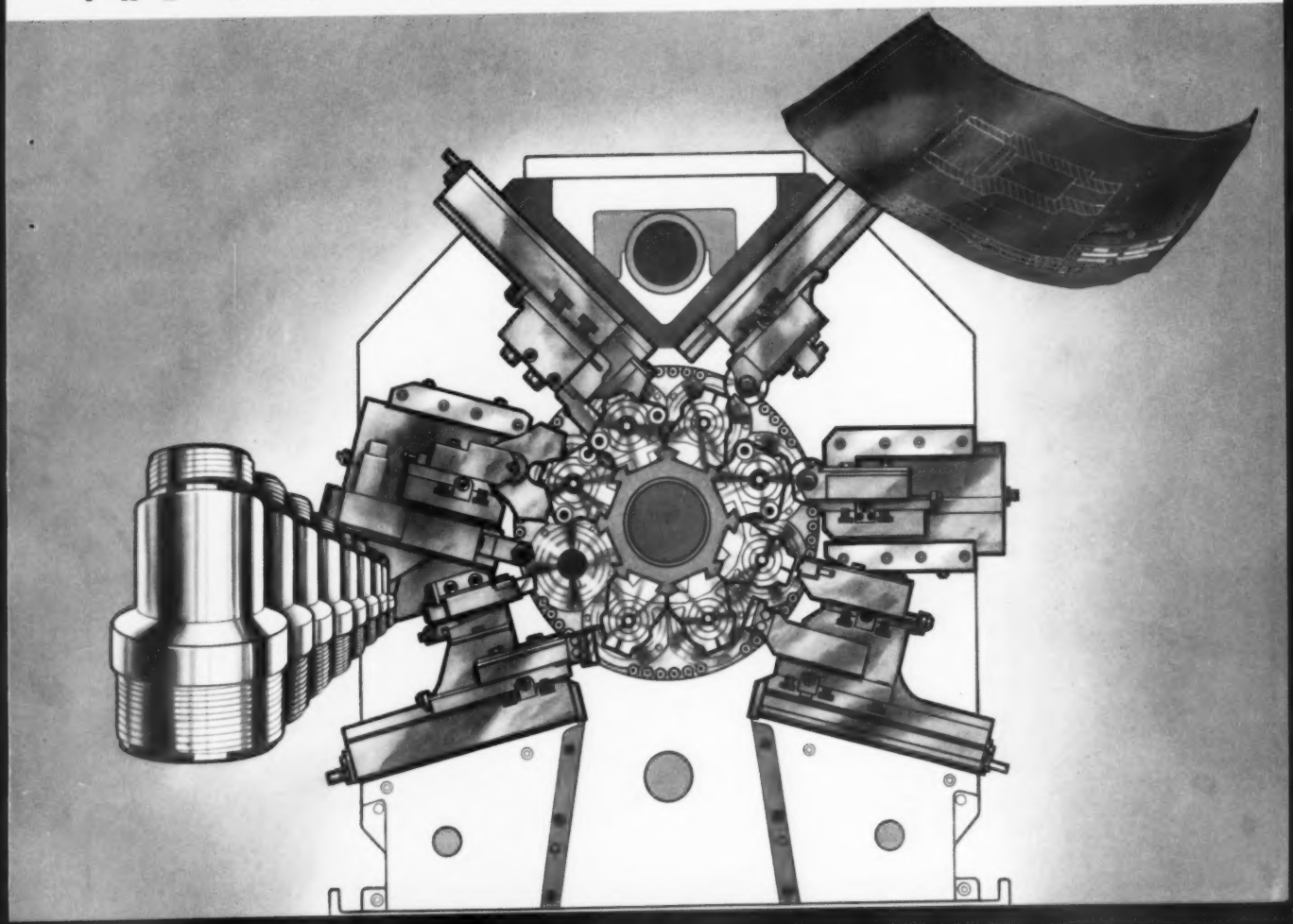
Nothing can out-date your operation quicker than better machines in the hands of a competitor. In the race to keep ahead on quality, price and delivery, nothing can put you out front faster than machines capable of consistently producing the highest quantity of finished pieces at the lowest possible cost. New Britain's new series of bar machines represents in every way the most advanced bar-turning units available. Each of the four-, six- and eight-spindle models has been redesigned, adding new features and improving older ones. Unlimited cross slide and end-working tool combinations, extremely fast operation (even on stainless) and a variety of models and features to choose from add up to some good reasons for incorporating New Britains into your replacement or production expansion plans.

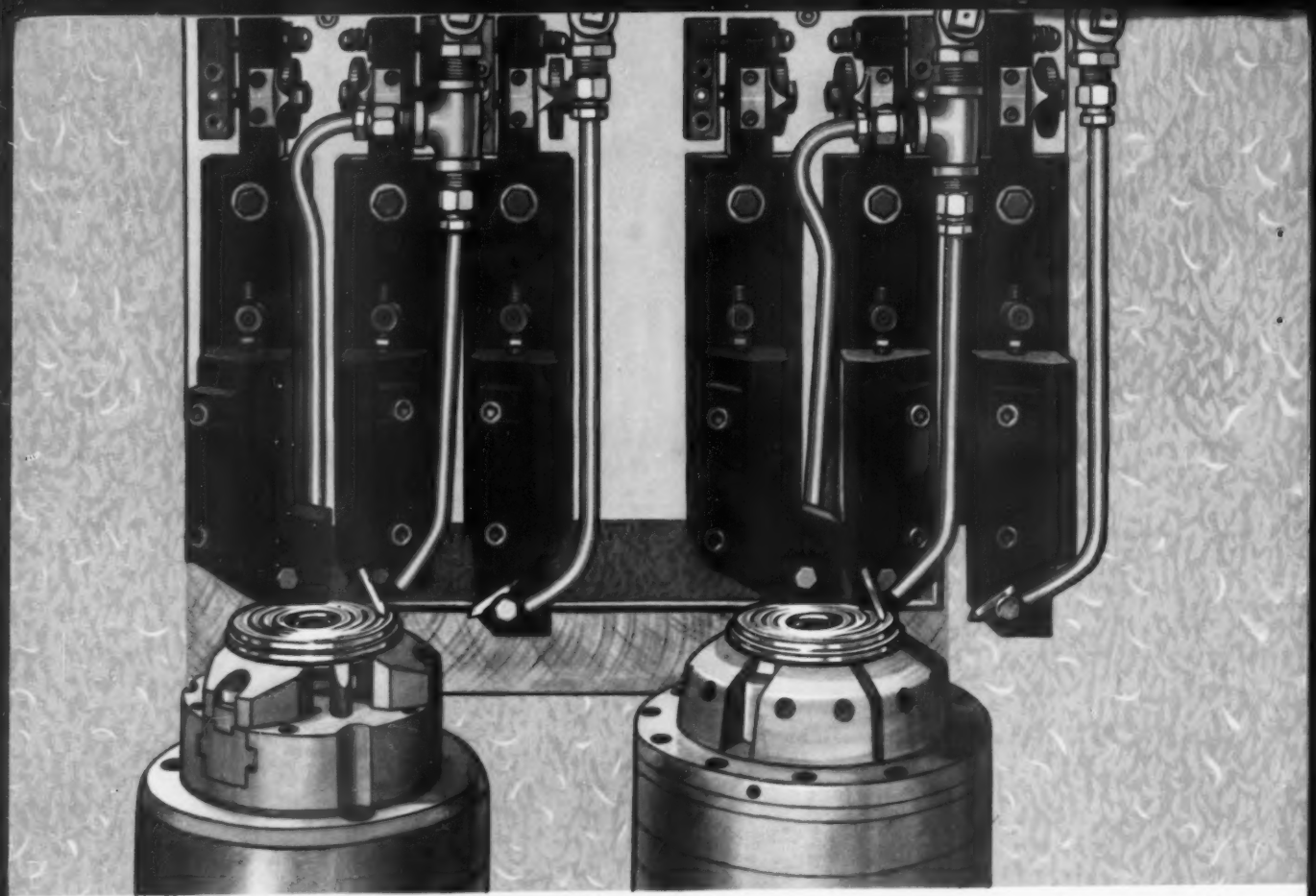
The eight-spindle model is the largest, most modern eight-spindle bar machine available. It has a stock capacity of up to 2⅝" and provides six independently-operated cross slides. As with all New Britain bar machines, the operations of the cross slides and end-working tool slide are disc-cam controlled for positive actuation, close tolerance machining and easy, rapid change-overs.

This is only a very small part of a story that is bound to interest you. The whole story and its significance in terms of your profits is available from your New Britain Representative. If you prefer, contact us directly at The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

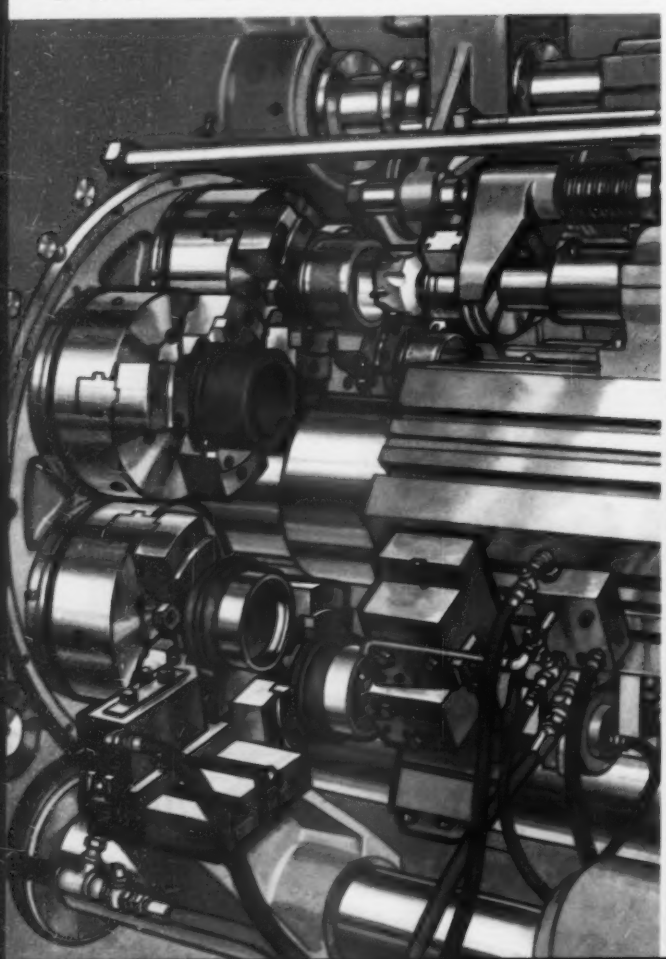


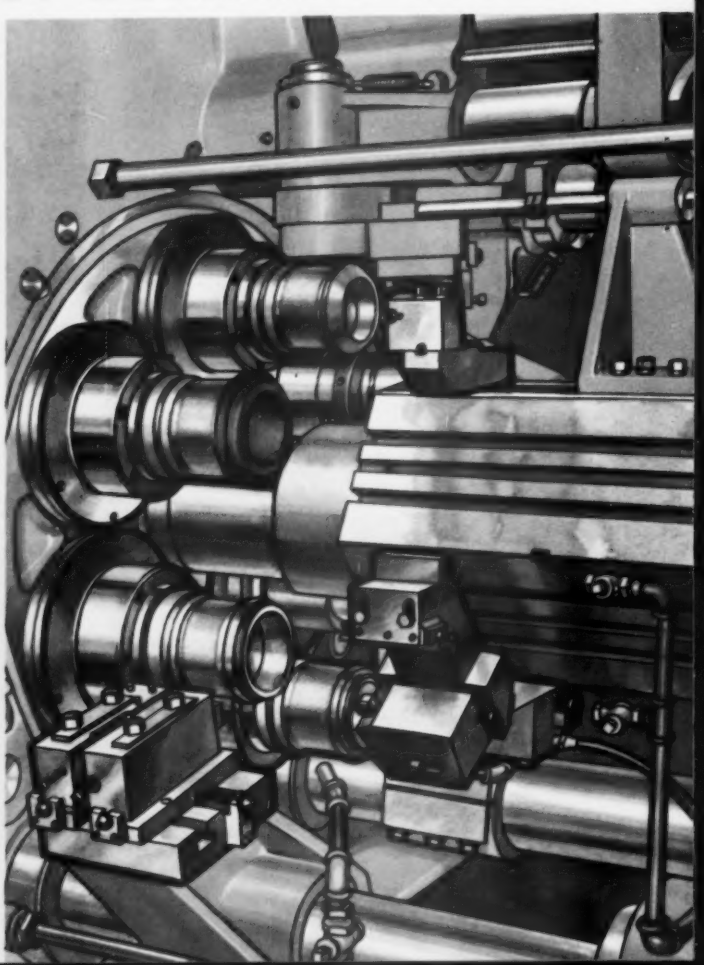
THE NEW BRITAIN MACHINE COMPANY





NEW BRITAIN · GRIDLEY MACHINE DIVISION





New Britain's new concept for contour turning and boring

Beyond a certain point, continued refinement of existing designs in machine tools ceases to make an appreciable contribution to performance. Thus in designing our New Series of Vertical Precision Boring Machines, we have incorporated several completely new design concepts to provide improved performance and greatly increase over-all usefulness.

For the first time machines of this type can be used as building block units. Their clean-sided design permits any number of self-contained machines, each with one or more spindles, to be arranged side by side and operated as a single unit. They also may be operated with equal efficiency as individual machines. Parts can be inverted on adjacent machines or on adjacent spindles of the same machine.

In order to take the fullest advantage of the precision inherent in cam control, long linkages between cams and slides have been eliminated. A pair of cams is mounted on a common shaft which is carried *within the vertical slide.* Since all slide actuating forces are contained in the vertical slide, both cams are directly adjacent to the slides they control and no outside forces are imposed on the slide ways. The result is maximum rigidity for heavy cuts coupled with extreme accuracy for close tolerance work.

This unique and eminently workable approach to contour turning and boring results in the highest order of accuracy on even the most complex pieces. Your New Britain Representative can give you details on the nine different models available in this series. For catalog material, write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Conn.

THE NEW BRITAIN MACHINE COMPANY

New Britain . . . still the best Chucker you can buy

We're not unhappy about the fact that for years, in many plants, the name New Britain has been synonymous with chuckers. New Britain Chuckers have turned out literally millions of pieces of work for practically every major industry in the world. This is less important to the prospective buyer of one of these machines, however, than the capabilities of these machines today. How do they stack up against other chuckers or even other types of machines capable of doing similar work? Pretty well, we think.

New Britain's open-end design still can't be beat for unlimited accessibility to the tooling area. This same wide-open feature makes it doubly more practical to adapt these machines to automatic loading and unloading.

The unusual combination of longitudinal and transverse forming motions is another unbeatable New Britain feature. The massive forming arms on New Britain Chuckers allow heavier cuts and cuts of much greater complexity. This ability to do more work can eliminate the need for second operation machines in many instances. For really complex work, two chuckers set up side by side, as shown here, each doing one side of the piece, can smooth the way for high production. Less complicated work can be set up to perform both sides of the same piece on a single machine.

These massive machines provide the tooling combinations, spindle speeds and power to perform the widest possible variety of work. Their basic design will stay new for years to come, continuing to provide profitable operation. You may know New Britain Chuckers, but you may not be fully aware of the improved series presently being offered. Why not call your New Britain Representative or contact us at The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

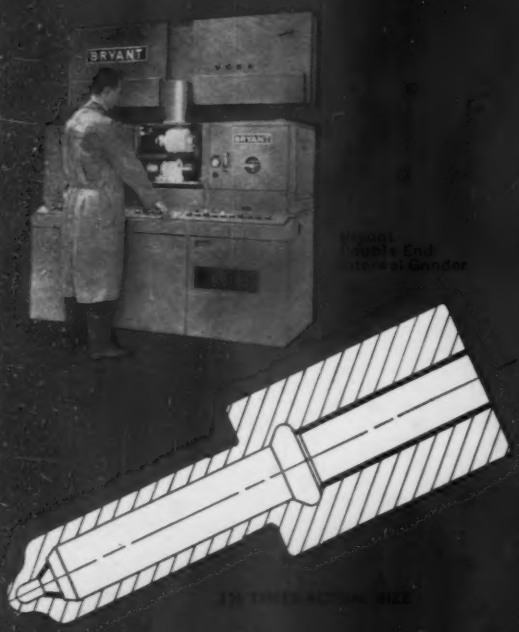
◀ CIRCLE 283 READER SERVICE CARD

CIRCLE 284 READER SERVICE CARD

CAN YOU TOP THESE 2 GRINDING JOBS?

They're tough. One requires grinding both a straight and a tapered bore in diesel nozzles and similar workpieces at a single chucking. The second requires grinding a wide range of races for miniature and instrument ball bearings. Both are handled efficiently and economically by Bryant high production internal grinders.

All Bryant industry-engineered grinders are proved out by statistical quality control to assure you of predictable day-after-day production quality. Got a tough internal grinding job? Just drop us a line, enclosing specs and production requirements.



SOLUTION to the diesel nozzle job is this new Bryant Double-End Internal Grinder which grinds both a straight and a tapered bore at a single chucking of the workpiece. Two opposed wheel slides and a rotary indexing worktable permit grinding two workpieces simultaneously. Completely automatic, it triples the productivity of conventional machines. And, because this duplex machine cycles automatically, operator simply has to load and unload workparts.

SOLUTION to the grinding of a wide range of miniature and instrument bearing races is the Bryant Model "B" Miniature Centalign® Internal Grinder and its "packaged tooling" for simple, quick job changeover. Available either for ball tracks or for bores, it's the standard machine for miniature bearing production throughout the world. Proved in production lines, it's acknowledged by all major bearing companies as the finest machine available.

BRYANT

Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT, U.S.A.

Internal Grinders • Special Machinery

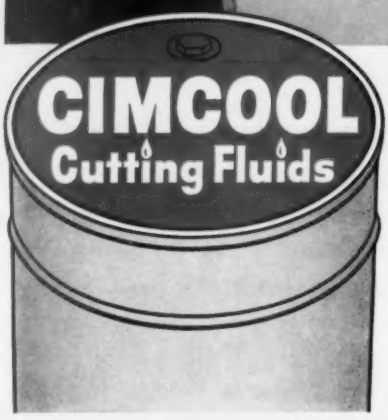
CIRCLE 285 READER SERVICE CARD

FIVE-WAY IMPROVEMENT

in grinding operations with the new cutting fluid, FIVE-STAR CIMCOOL, on the job in Pennsylvania.

(Company name on request)

FIELD SERVICE REPORT
in the manufacture of air compressors. They had tried several cutting fluids but kept having problems with rust, rancidity and skin irritation.
Then we installed Five-Star Cimcool at 50-1 for a 3 months test, grinding iron, stainless steel, tool steel and aluminum. The results were excellent.
They have no rancidity, even after 3 months operation. They proved by laboratory testing that skin irritation had been eliminated. There was no rusting of iron or steel, no corrosion of bronze or aluminum parts. They not only saved money by not having to change the cutting fluid, but they doubled the pieces per dress. They are very enthusiastic about Five-Star Cimcool.
Herb Whitacre
Pittsburgh Office



FOR 100% OF ALL METAL CUTTING JOBS

Production-Proved products of The Cincinnati Milling Machine Co.

FIVE-STAR CIMCOOL°—New, versatile "one-mix" cutting fluid, long-lasting, trouble-free.
CIMPERIAL° — Heavy duty replacement for cutting oils in those low-speed tough jobs.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Marks Reg. U. S. Pat. Off.

TAPS

DIES

GAGES

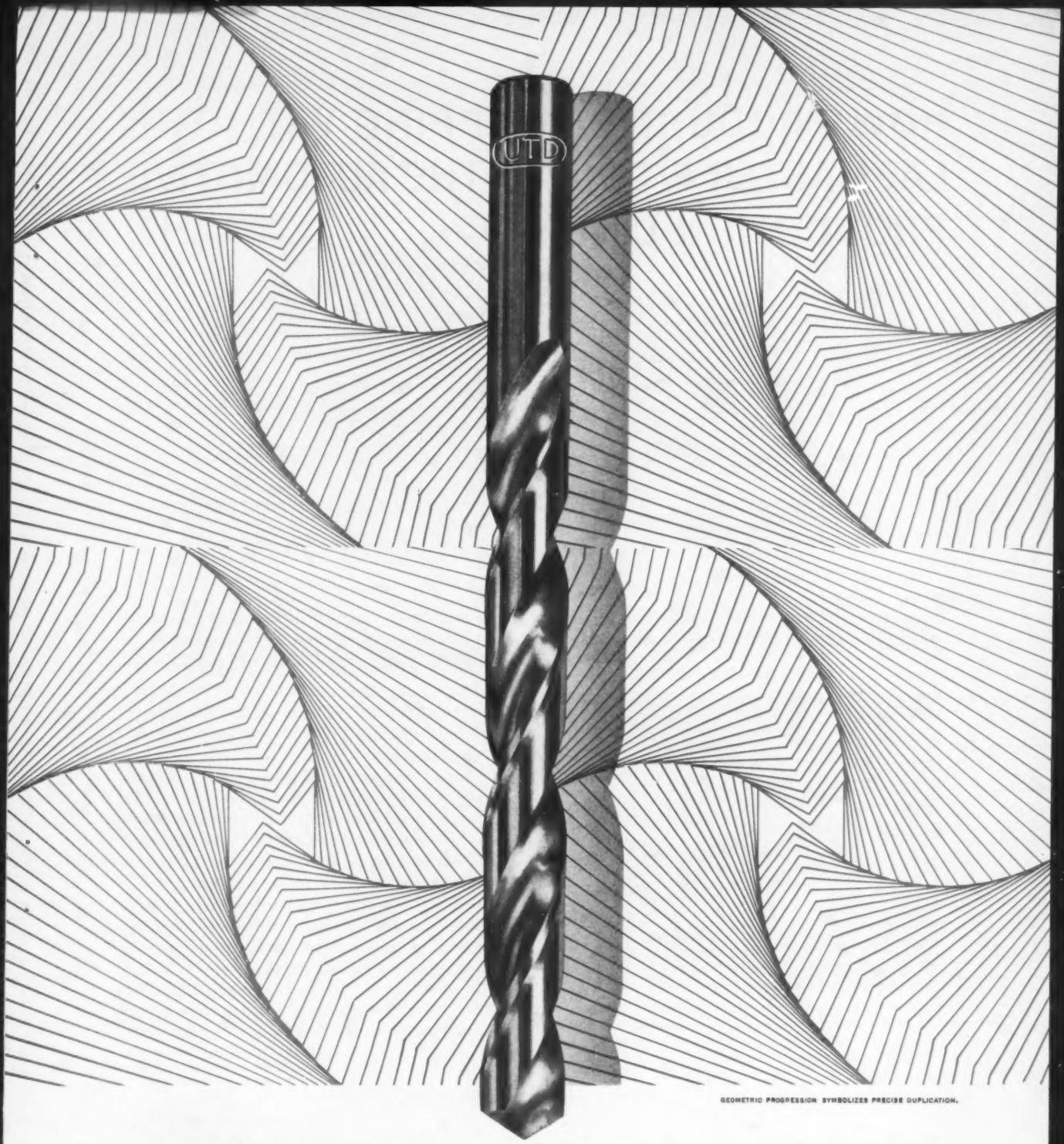
SCREW PLATES

PRECISE DUPLICATION can be visualized on a drawing board, by plotting geometric progressions. But to make this symbol a cutting tool reality calls for expert engineering. Engineering of this sort duplicates CARD tools precisely. CARD tools from best distributors, and valuable advice from CARD technical men are available from coast to coast. S. W. CARD DIVISION, Union Twist Drill Company, Athol, Mass. CARD Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, and San Francisco.

CARD

CIRCLE 287 READER SERVICE CARD

360.1.1



GEOMETRIC PROGRESSION SYMBOLIZES PRECISE DUPLICATION.

DRILLS
REAMERS
MILLING CUTTERS
END MILLS
GEAR CUTTERS
HOBS
CARBIDE TOOLS
INSERTED BLADE CUTTERS

UTD

CALCULATED TO CUT COSTS. Like any geometric progression, UNION cutting tools create a pattern of precise duplication... providing identical dimensions in each type and size, and identical performance on each job. That is why they are calculated to keep your production high, your costs low. UNION distributors and technical service are available nationally. Fully stocked UNION warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco. UNION TWIST DRILL COMPANY, Athol, Massachusetts. S.W.Card Div., Mansfield, Mass., Butterfield Div., Derby Line, Vt.

UNION

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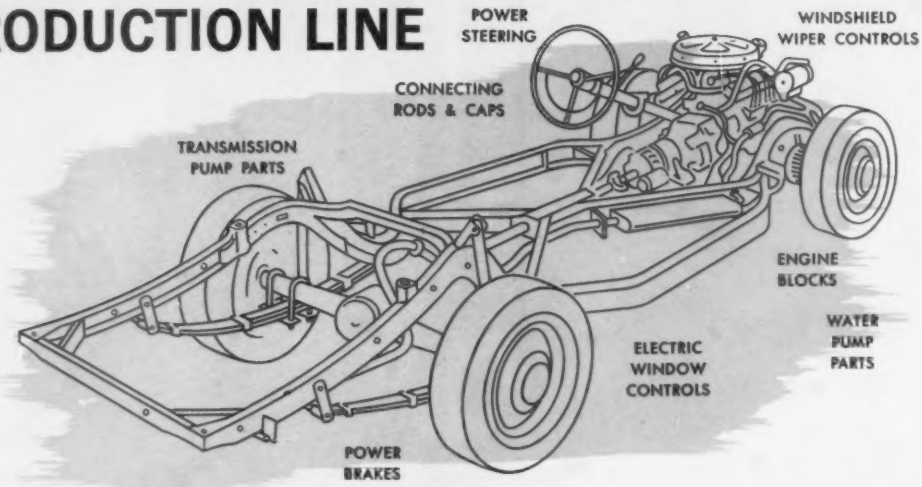
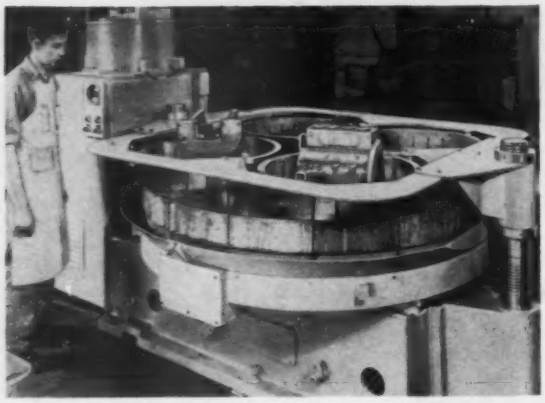
36.1.1

HOW PRODUCTION LAPPING WITH THE LAPMASTER FITS INTO THE AUTOMOTIVE PRODUCTION LINE



There are many money-saving reasons why machine lapping with the Lapmaster has become an important, and in many cases a necessary, operation in the production of automobile parts, from large engine blocks to small water pump impellers. For instance:

A GOOD EXAMPLE



Production lapping of two surfaces on 4-cylinder engine blocks on a Model 72 Lapmaster, provides a gasketless oil seal at the oil pan juncture and a gasketless compression seal between head and block.

There is no other production way of finishing parts to a flatness of .0000116" or less with a micro-inch finish of 2 to 3 RMS with absolute uniformity, piece-after-piece.

Normal warpage in aluminum alloy castings easily removed to provide flat surfaces for the accuracy required in subsequent operations. Warpage resulting from clamping or chucking during previous milling and grind operations is also economically removed with the Lapmaster.

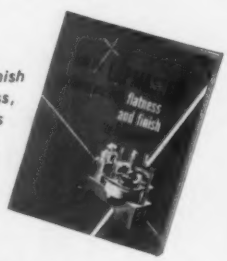
Substantial production savings are also possible because lapping eliminates need for deburring, finish grinding or milling operations and permits use of increased milling speeds.

In small lots or thousands per day, production is not interrupted or slowed down for replacing or reconditioning lap plates because Lapmaster conditioning rings automatically keep lap plate flat.

New Catalog Tells More

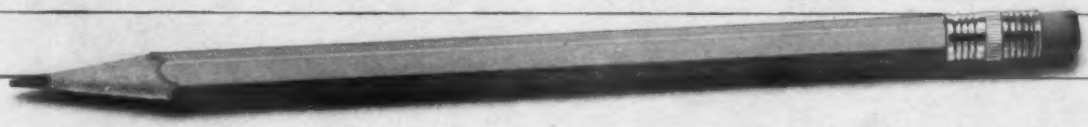
Lapmaster®
...THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

If flatness, parallelity or a precision finish is a problem in your production process, find out how Lapmaster is saving others money. This 24 page catalog includes technical data, specifications, tooling set-ups and actual production case histories. Send for a copy.



A product of
Crane Packing Company
6436 OAKTON ST. • MORTON GROVE, ILL. *(Chicago Suburb)*
In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

Lower Your Machining Costs With This Remarkable Tool



Simply by penciling in a specification for FERROCARBO-treated iron when you order gray-iron castings, you can realize large-scale savings in machining costs. The increased surface machinability of FERROCARBO-treated irons, by independent laboratory test, is 31 to 63 percent. This makes possible savings in the machining of castings that may easily exceed their original cost.

For faster machining, longer tool life and decreased down-time, always specify FERROCARBO-treated castings. They are available from leading foundries everywhere.

FERROCARBO® is a product by **CARBORUNDUM**

Complete technical data on Ferrocarbo is available to your foundries from Kerchner, Marshall & Company, Pittsburgh, Miller and Company, Chicago.

U.S. Slide Feeds

multiple feeding cuts stamping costs

Coil stock of regular and irregular profile can be fed singly or in multiples of two or more strips, accurately and at high speeds by U.S. Slide Feeds. Metal, plastic, wire, paper and fibre are fed with equal facility.

G. & A. Machine Works, New York, N. Y. has produced more than one hundred million webbing clips with the U.S. Slide Feed illustrated.

Two strips of 19 gauge cold rolled steel, ¾" wide are fed simultaneously into a 6 station scrapless die. Pilots are not used. A Model 68-A, U.S. Slide Feed and Stock Drag, arranged for multiple feeding produces 120,000 perfect parts per 8 hour day.

Send us specifications of the parts you are now running, or considering. Our developments in press feeding equipment and techniques may provide a means to important savings. Your inquiries will receive prompt attention.

PRODUCTS

U.S. TOOL COMPANY, INC.

Dept. A, AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slide® • U. S. Multi-Hitary® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE 291 READER SERVICE CARD

CIRCLE 701 READER SERVICE CARD ►

Look to

FAFNIR

for leadership in ball bearings

Where cost is your problem...

Costs can nip good design ideas in the bud. Fafnir helps cut costs with Flangette Units. Millions of these ball bearing "economy packages" — a Fafnir "first" — are used to improve performance and reduce maintenance on products ranging from small conveyors to giant combines. When you're up against costs... or *any* bearing problem . . . look to Fafnir. The Fafnir Bearing Company, New Britain, Connecticut.

50 YEARS OF EXPERIENCE
IN THE MANUFACTURE OF
BALL BEARINGS

FAFNIR
BALL BEARINGS

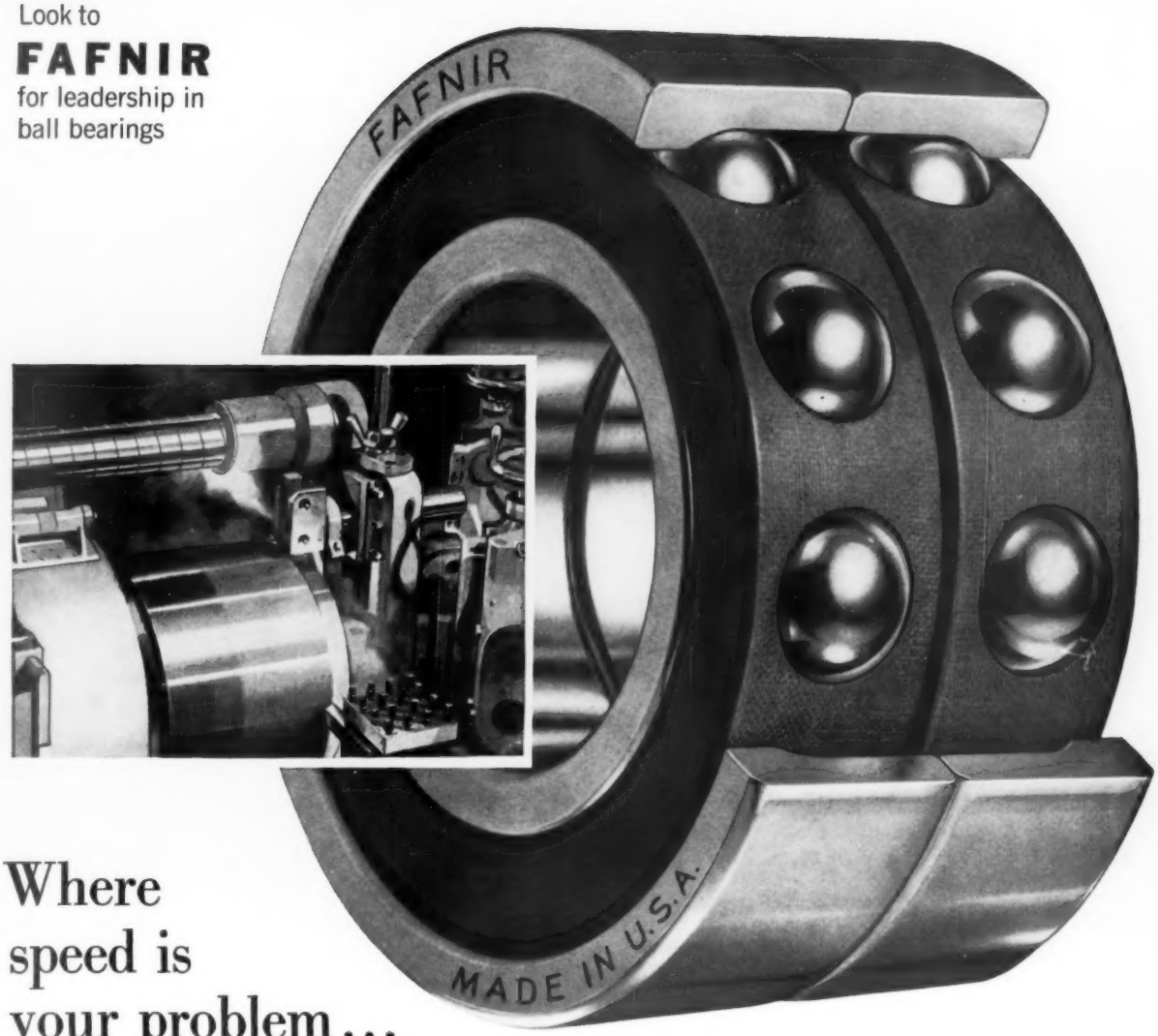
Look to
FAFNIR
for leadership in
ball bearings

Where dirt is your problem...

Dirt is cheap . . . but not when it gets into bearings. It handicaps production . . . runs up costs . . . shortens product life. How to keep dirt out? Disc harrow makers do it with Fafnir Ball Bearings . . . triple-sealed to "run clean" where it's dirtiest. When you're up against dirt . . . or *any* bearing problem . . . look to Fafnir for the diversity, the capacity, the research to find your answer. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS

Look to
FAFNIR
for leadership in
ball bearings



Where speed is your problem...

Today's high speeds put the spotlight on bearings. For when bearings fail, costs rise . . . and profits drop. Machine tool builders know this. That's why they specify Fafnir Ball Bearings for high speed applications — 100,000 rpm and up. So, when you're up against speed . . . or *any* bearing problem . . . look to Fafnir for the diversity, the capacity, and the research to find your answer. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR
BALL BEARINGS

Look to
FAFNIR
for leadership in
ball bearings

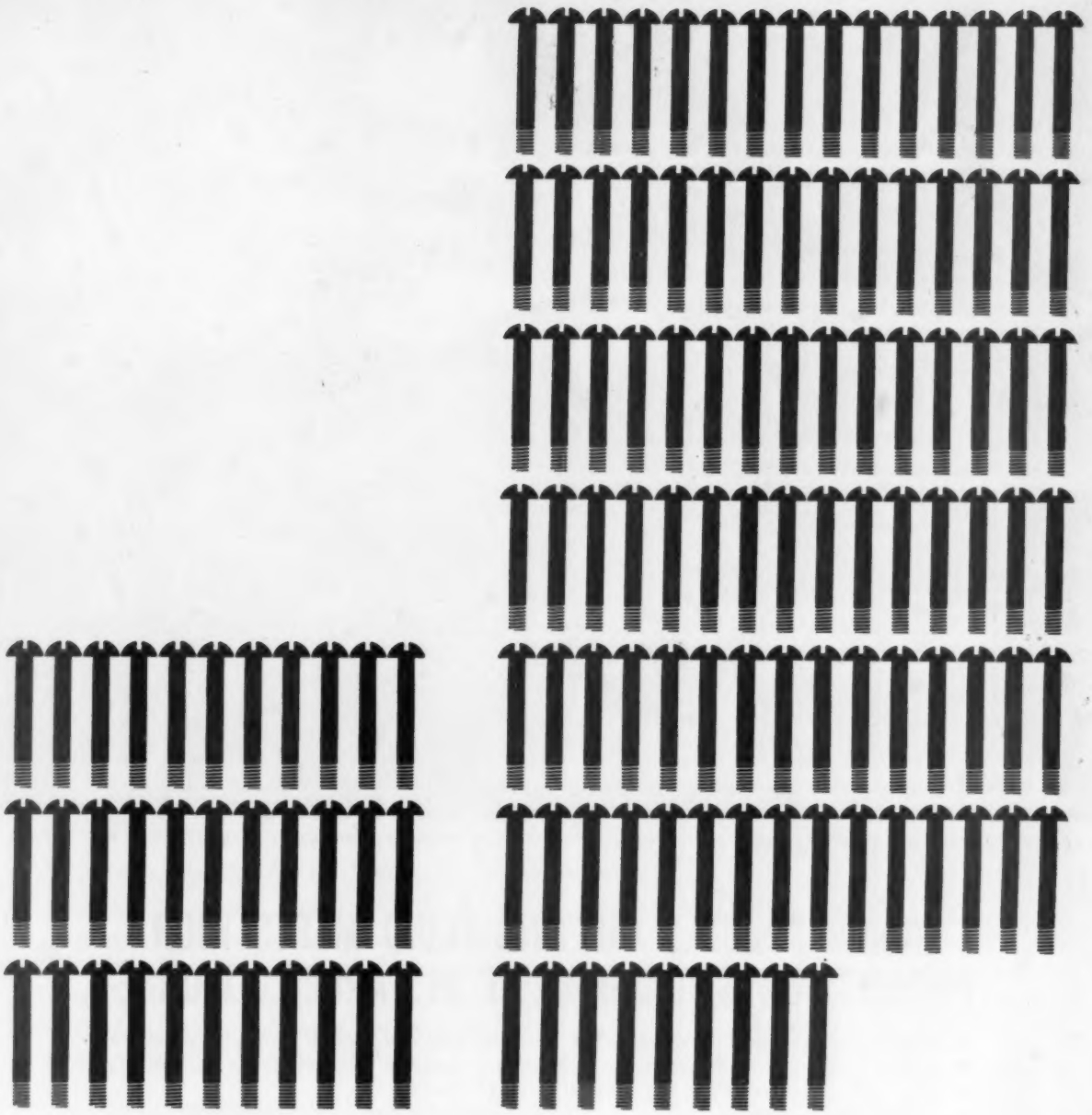
Where heat is your problem...

Some bearings "freeze" under prolonged high heat. When they do, performance drops off . . . costs rise . . . and the heat's on *you!* The answer? Fafnir Ball Bearings engineered for high temperature service. For instance, in the X-15 manned rocket, they're used by the hundreds at critical points. So, when you're up against heat . . . or *any* bearing problem . . . look to Fafnir for the diversity, the capacity, the research to find your answer. The Fafnir Bearing Company, New Britain, Connecticut.

"MADE IN U. S. A."

This stamp on a Fafnir Ball Bearing means finest quality and workmanship . . . dependable supply . . . competent engineering help . . . and **responsibility** in meeting your bearing needs. It's worth bearing in mind.

FAFNIR
BALL BEARINGS



33
parts per pound
from
most metals

99
parts per pound
from Olin cold processed
aluminum rod and bar

Olin Aluminum's *cold processed* rod and screw machine stock gives you up to three times as many parts per pound as ferrous metals or brass. Olin's *cold processed* method produces rapid cutting aluminum stock with finer grain for better machining characteristics. Fewer secondary operations are necessary in many cases, and the blemish-free metal results in better finishes. A full range of color-coded alloys, in rounds and hexagons, in a wide range of sizes, are immediately available from the stocks of your nearby Olin Aluminum Distributor.

All Olin Aluminum advisory services are available without charge to manufacturers who want to convert machining operations to aluminum, who are developing a new aluminum product, or who have questions about selection or application of any Olin Aluminum alloy.

Olin
ALUMINUM
400 PARK AVE., NEW YORK 22, NEW YORK

◀ CIRCLE 704 READER SERVICE CARD

▲ CIRCLE 296 READER SERVICE CARD

Heavy flow of Kerns Soluble Cutting Fluid prolongs tool life while keeping part and hob exceptionally cool during gear hobbing operation on a Farmall tractor clutch shaft.

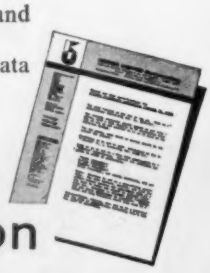
KERNS SOLUBLE CUTTING FLUID MEETS HIGH PRODUCTION STANDARDS AT IH FARMALL WORKS

Researched and developed by Kerns United, this specialized lubricant is used on a variety of operations at the Farmall Works of the International Harvester Company including reaming, drilling, tapping and hobbing . . . with guaranteed performance.

As machining operations and metals vary, so do lubricants. Know what can be accomplished by utilizing Kerns capabilities, experience and products formulated to meet your specific requirements. It's easy . . . see the results of a tailored lubricant in your plant at no cost by taking advantage of Kerns Memo Billing Trial Basis.

Manufacturers of Cutting, Grinding, Drawing, Forging, Phosphatizing, Cleaning, Wire Drawing and Spray Booth Compounds; Rolling Oils, Rust Preventives, Cling Oils and Specialized Greases.

Write for further details on Kerns MEMO BILLING TRIAL BASIS offer and/or technical data sheets on any of the above items.



World's largest Exclusive Manufacturer of Specialized Industrial Lubricants.

KERNS UNITED Corporation

2659 East 95th Street • Chicago 17, Illinois

Subsidiary: KERNS PACIFIC Corporation, *630 N. Batavia St., Orange, California*

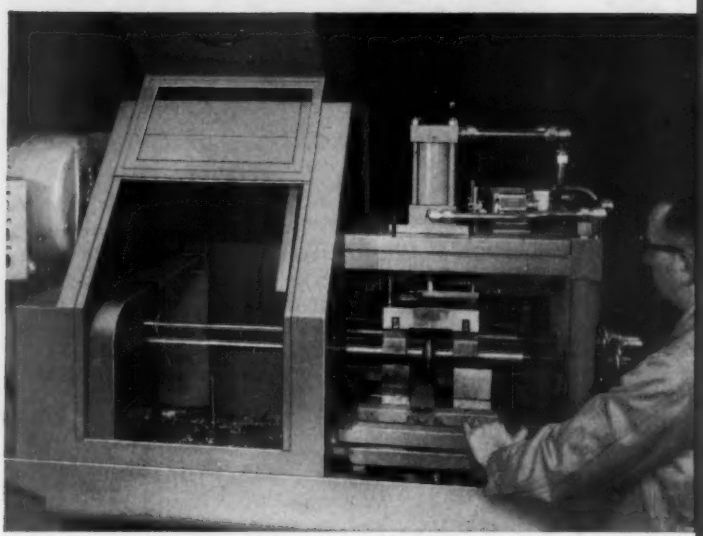
Offices in Principal Cities throughout the U.S.A.

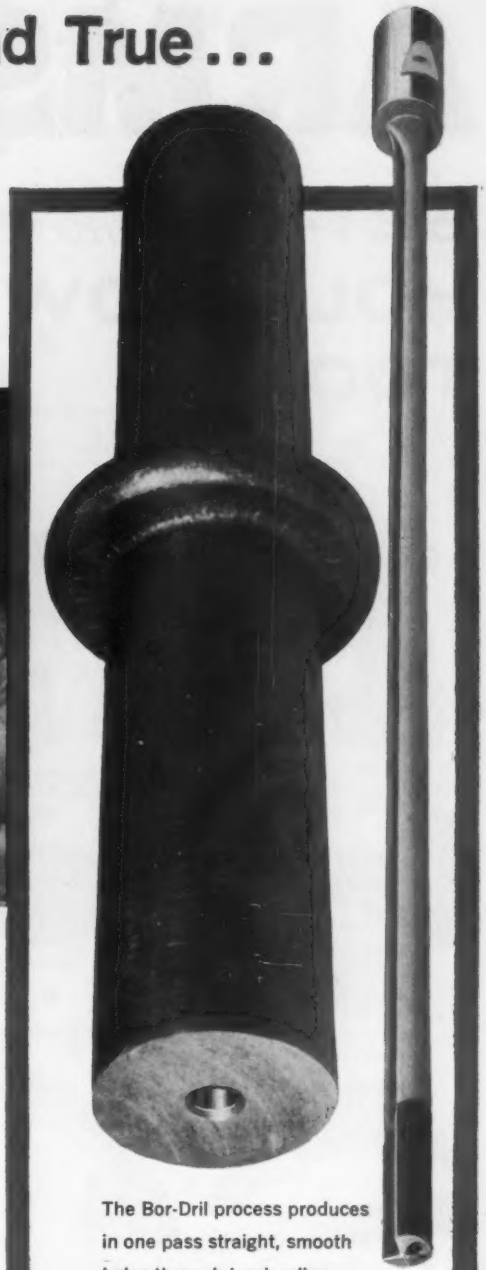
CIRCLE 297 READER SERVICE CARD

Deep Holes... Fast and True... with Ex-Cell-O

BOR-DRIL

Process





The Bor-Dril process produces in one pass straight, smooth holes through track roller shafts 22½" long and weighing about 75 pounds each. Production is 20 pieces per hour on the two-station machine.

Drilling 11/16" diameter holes the full length of 22½"-long forgings posed a tough problem for production engineers who need the economy of volume output, the time-savings of one-step operations, and the performance of precision equipment. But they found the answer in Bor-Dril, Ex-Cell-O's process for gun-type drilling with standard production boring machines.

Measured in terms of production efficiency, the result is 20 pieces per hour, from an Ex-Cell-O Model 752 Precision Boring Machine set up for Bor-Drilling. Secondary operations are eliminated.

Bor-Dril can be applied easily and economically wherever you have long, small-diameter holes to produce to precision tolerances. See your Ex-Cell-O Representative, or submit your requirements direct to Ex-Cell-O for prompt analysis and cost estimate.

61-78M

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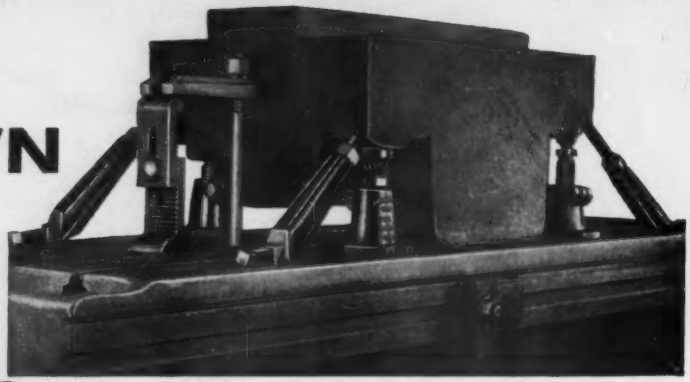
Machinery Division

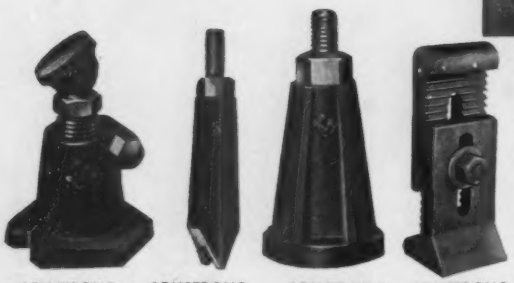
EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS





ARMSTRONG PLANER JACK — ARMSTRONG BRACING JACK — ARMSTRONG VERTICAL JACK — ARMSTRONG ADJUSTABLE STEP BLOCK

ARMSTRONG "T" SLOT BOLT — ARMSTRONG "T" SLOT NUTS

ARMSTRONG NUTS — ARMSTRONG WASHERS

ARMSTRONG UNIVERSAL ADJUSTABLE CLAMP

ARMSTRONG SET-UP WEDGES — ARMSTRONG "T" SLOT CLAMP

ARMSTRONG PLAIN CLAMP — ARMSTRONG SCREW HEEL CLAMP — ARMSTRONG GOOSE NECK CLAMP

ARMSTRONG DOUBLE FINGER CLAMP — ARMSTRONG FINGER CLAMP — ARMSTRONG "U" CLAMP

Whatever its shape, a work piece can be quickly, easily and safely set up on any T-slotted table with ARMSTRONG Set-up Tools. Comprising a complete "system" of supporting and holding devices in all essential sizes, ARMSTRONG Set-up Tools usually pay for themselves on the first job and continue to lower costs for years to come.

Save Time: Keep costly machines and high priced men producing—save time otherwise lost while operators rummage in the scrap box for materials with which to devise makeshift set-up methods.

Prevent Breakage and Spoilage—correctly designed, machined from special steels or drop forged and heat treated, they are extremely stiff, strong and reliable.

Increase Accuracy—hold work rigidly and support it fully regardless of shape.

Prevent Accidents—end risk of set-up failure with resulting tool breakage, damage or personal injury.

Increase Profits—by reducing down time, increasing man hour output, assuring accuracy, ARMSTRONG Set-up and Hold-down Tools cut costs and build profits. They are part of every properly equipped tool room and shop.

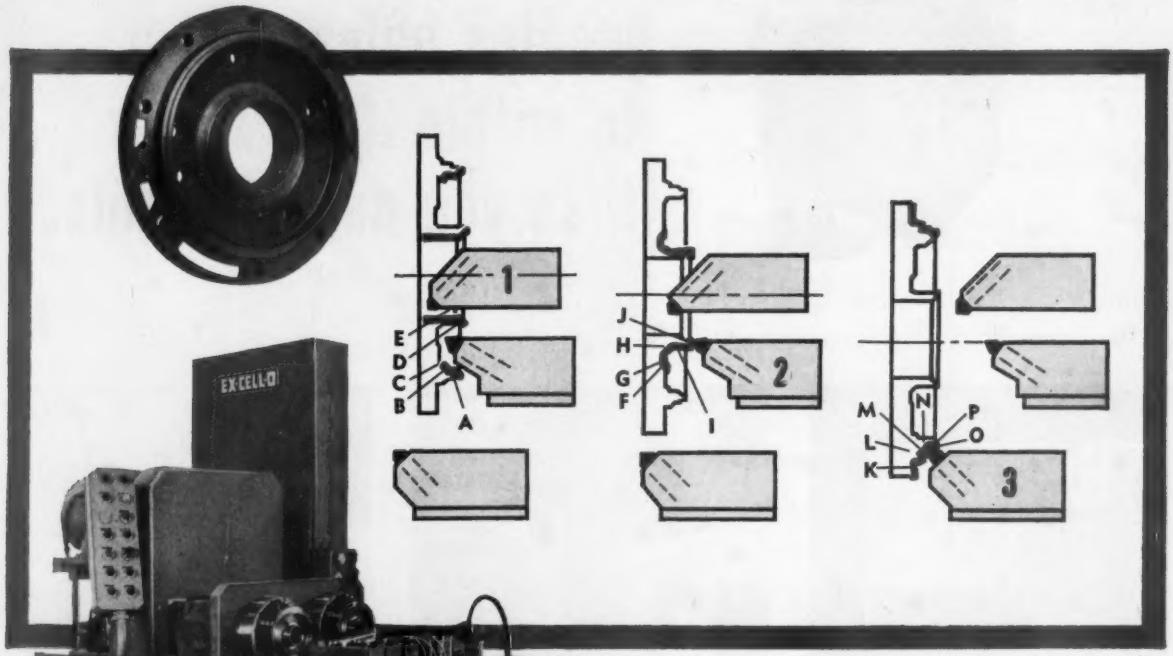
Your Local Armstrong Industrial Distributor carries a good stock of Set-up and Hold-down Tools. He offers you quick, efficient service on these, as well as other, quality ARMSTRONG Tools.

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

ARMSTRONG BROS. TOOL CO.

5215 W. ARMSTRONG AVE. • CHICAGO 46, ILL.

Ex-Cell-O Model 312 generates 21 surfaces per part!



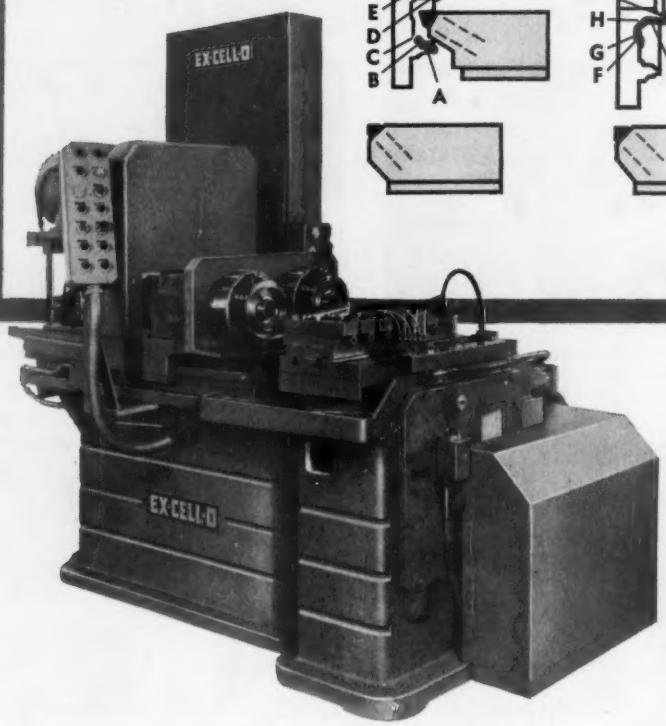


Diagram shows tools in quick-change magazines at the end of their strokes.

Tool No. 1 generates chamfer A, bores diameter B, generates radius C, traverses out, chamfers D and bores E.

Tool No. 2 generates surfaces F, G, H, I, and J with cam-controlled accuracy.

Tool No. 3 faces K, generates radius L, tapers M, turns N, chamfers O and generates radius P in cast-iron clutch assemblies.

Ex-Cell-O Cam-Operated Precision Boring Machines are designed especially for work requiring consistently precise boring, plunge-facing, grooving, chamfering and other O.D. and I.D. contours. Table and slide movements on hardened and ground ways are guaranteed by direct cam action—there are no levers, no complex linkages. For maximum accuracy, cams can be ground for you in our plant on numerically-controlled machines.

Two models, 308 and 312, rough, semifinish and finish a wide range of parts. Ask your Ex-Cell-O Representative for data, or write direct for details.

61-17M

EX-CELL-O FOR PRECISION

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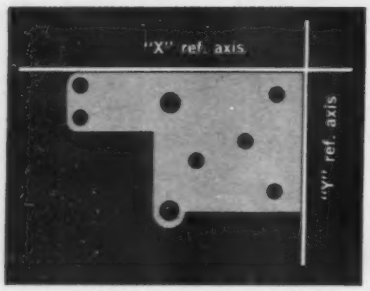
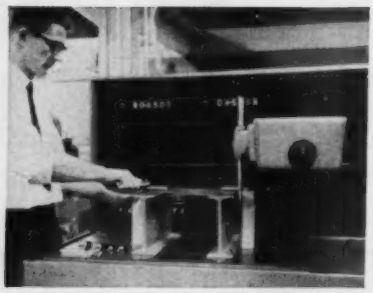
Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Sheffield Ferranti FI-22 locates holes to within .001" faster than you can read this

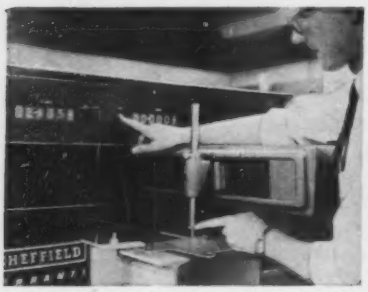


1. The problem: locate the holes in this piece to within .001". Here's how it works.



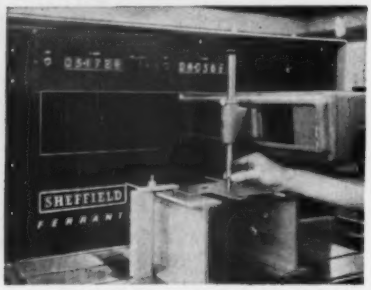
2. Mount and clamp workpiece to table. Working range of table is 15" by 24".

3. Insert flat probe for aligning and locating reference edges of work piece.



4. Move spindle along "X" axis until probe touches reference edge, and push zeroing button. Repeat for "Y" axis.

5. Replace flat probe with suitable tapered probe. Interchangeable tips available for a wide range of hole sizes.



6. Move spindle over piece, and lower probe into hole. Numerals in readout panels will indicate exact hole position to .001".

You can see why the FI-22 is up to ten times faster than conventional surface plate and height gage inspection. On top of that, you can use it for layout scribing and center-punching. Write for Bulletin FI-22X and ask your Sheffield representative where you can see a demonstration of this machine.

The **SHEFFIELD** *Corporation* — *Dayton 1, Ohio*

A subsidiary of The Bendix Corporation

Inspection Gages, Dimensional Control Instruments, Machine Controls, Automatic Gaging & Assembly Systems, Measuray® X-Ray Thickness Measuring, Crushtrue® & Multiform® Grinders, Cavitron® Ultrasonic Machine Tools, Press-Pacer® Transfer Units, Large Dies, Tooling, Contract Manufacturing.

DO YOUR OPERATIONS DEMAND ACCURATE CENTERS?

Ex-Cell-O Center Lapping Machines Increase Accuracy, Reduce Scrap!

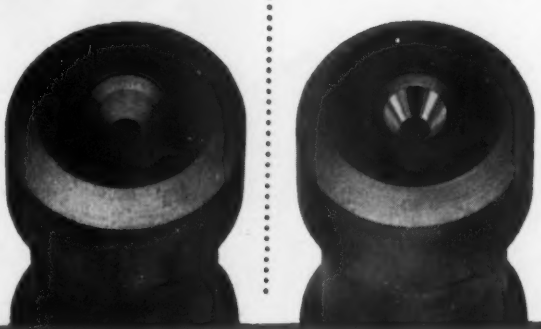
Precision Center Lapping Machines remove heat-treat scale, and eliminate roughness and distortion of centers to insure accuracy in subsequent operations.

Easy to use and modestly priced, Center Lapping Machines include as standard, inbuilt equipment Ex-Cell-O Precision Spindle and manual diamond dresser.

See your Ex-Cell-O Representative, or write for Bulletin 40271.

BEFORE LAPPING

- Out of line
- Out of round
- Incorrect angle
- Rough or torn



AFTER LAPPING

- Perfect alignment
- True roundness
- Precise angle
- Mirror-smooth

60-37

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Machinery Division

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

They "Go Together" For

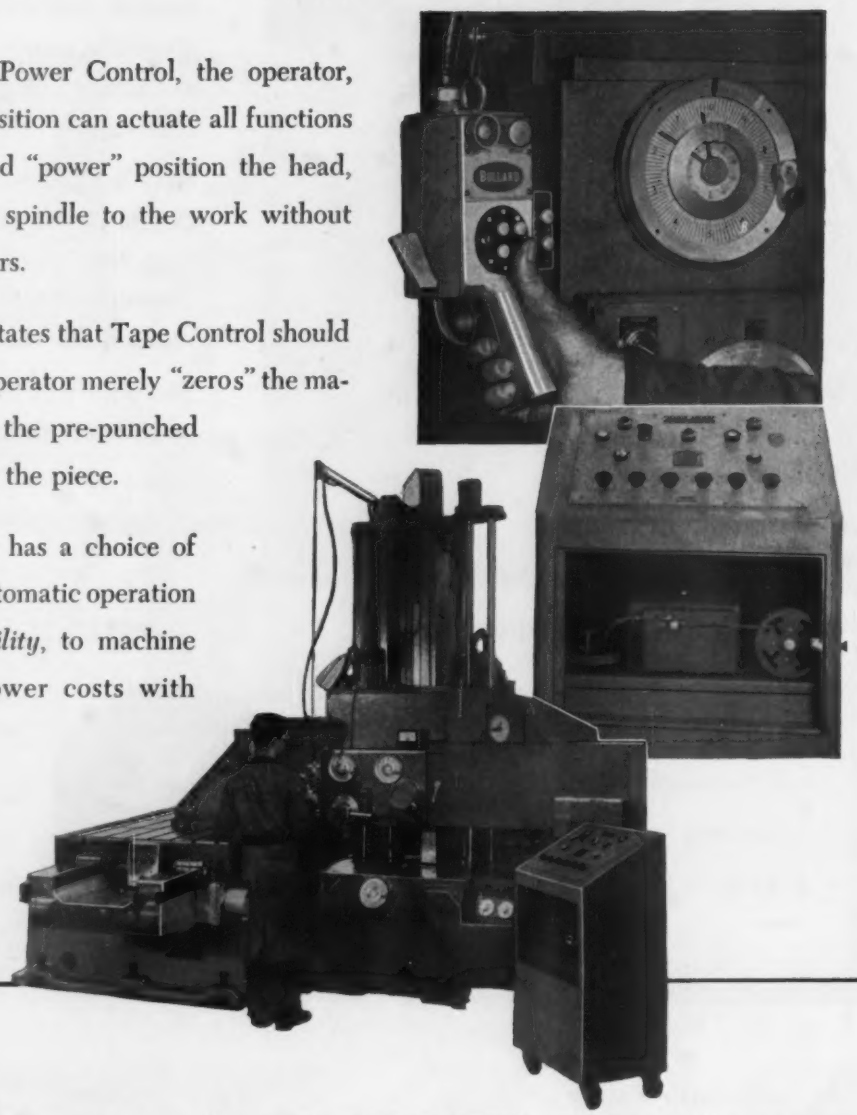
CENTRALIZED POWER CONTROL for manual operation and **NUMERICAL TAPE CONTROL** for automatic operation provide complete versatility of the Bullard DYNAMILL H.B.M. to insure maximum production.

Complete Versatility

With Centralized Power Control, the operator, from his normal position can actuate all functions of the machine and "power" position the head, table, saddle, and spindle to the work without hand cranks or levers.

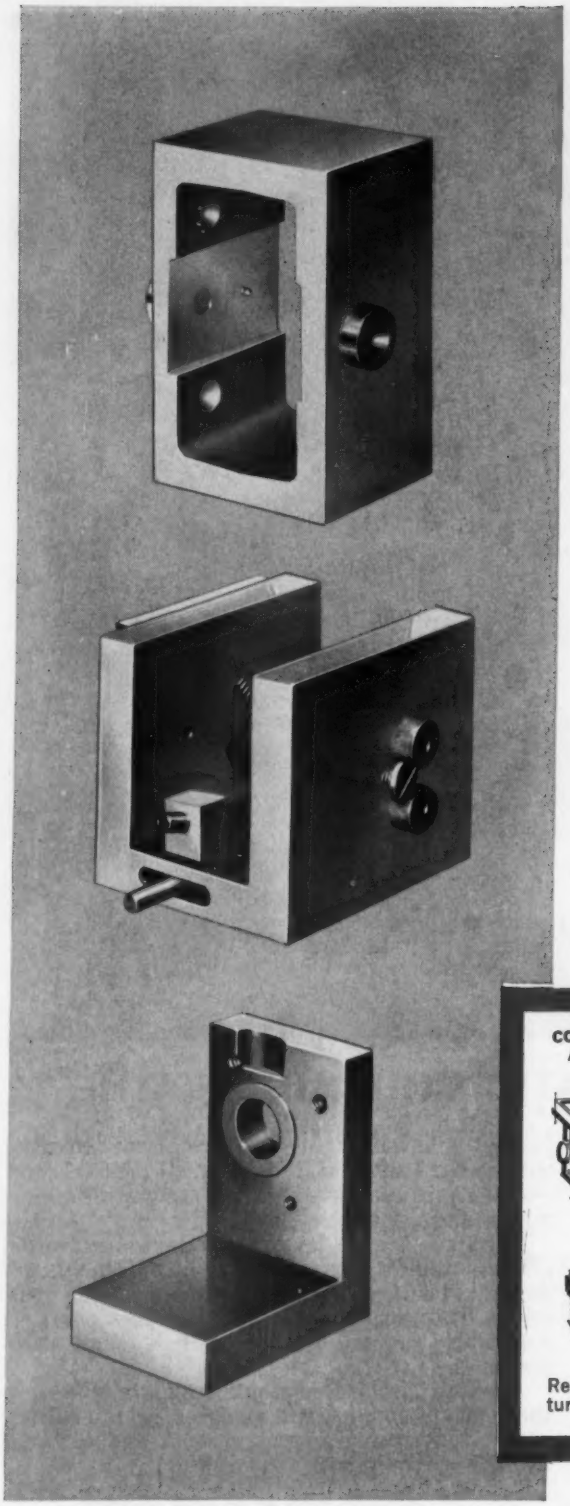
When the work dictates that Tape Control should be employed, the operator merely "zeros" the machine according to the pre-punched tape for machining the piece.

Thus, the operator has a choice of either manual or automatic operation — *complete versatility*, to machine more pieces at lower costs with increased profits.



BULLARD

For Complete Information on the Bullard DYNAMILL H.B.M., call your nearest Bullard Sales Office or Distributor or write The Bullard Company, Bridgeport 9, Connecticut.



Build Fixtures Faster, at Lower Cost with Ex-Cell-O Micron Sections!

Available for immediate shipment, Ex-Cell-O Micron Sections are pre-machined square and parallel from high tensile strength cast iron to save you design and fabrication time.

Ideal for job-lot tooling, Micron Sections are cut to order from standard 25″ lengths. Wall thicknesses range from ⅝″ to 1¼″, with overall dimensions from 3″ x 3″ to 8″ x 10″.

Call your local Ex-Cell-O Representative or Distributor, or contact Ex-Cell-O direct. Phone TOwnsend 8-3900; TWX—DE 876; Wire ZTC.

COMPONENTS FOR ALL YOUR JIG & FIXTURE NEEDS—AVAILABLE IMMEDIATELY FROM A SINGLE, RELIABLE SOURCE!

Lift Swing Fixtures for fast drilling of difficult holes.

Fixture Components Clamp Assemblies & Fixture Details.

Drill Jig Bushings Chrome alloy bearing steel • Tungsten carbide • Trans-Lok, Press-Lok for plastic jigs.

Reader Service Card Number is for Micron Sections Literature only. Request literature on above items separately.

61-19 BU

EX-CELL-O FOR PRECISION

Bushing Sales Division

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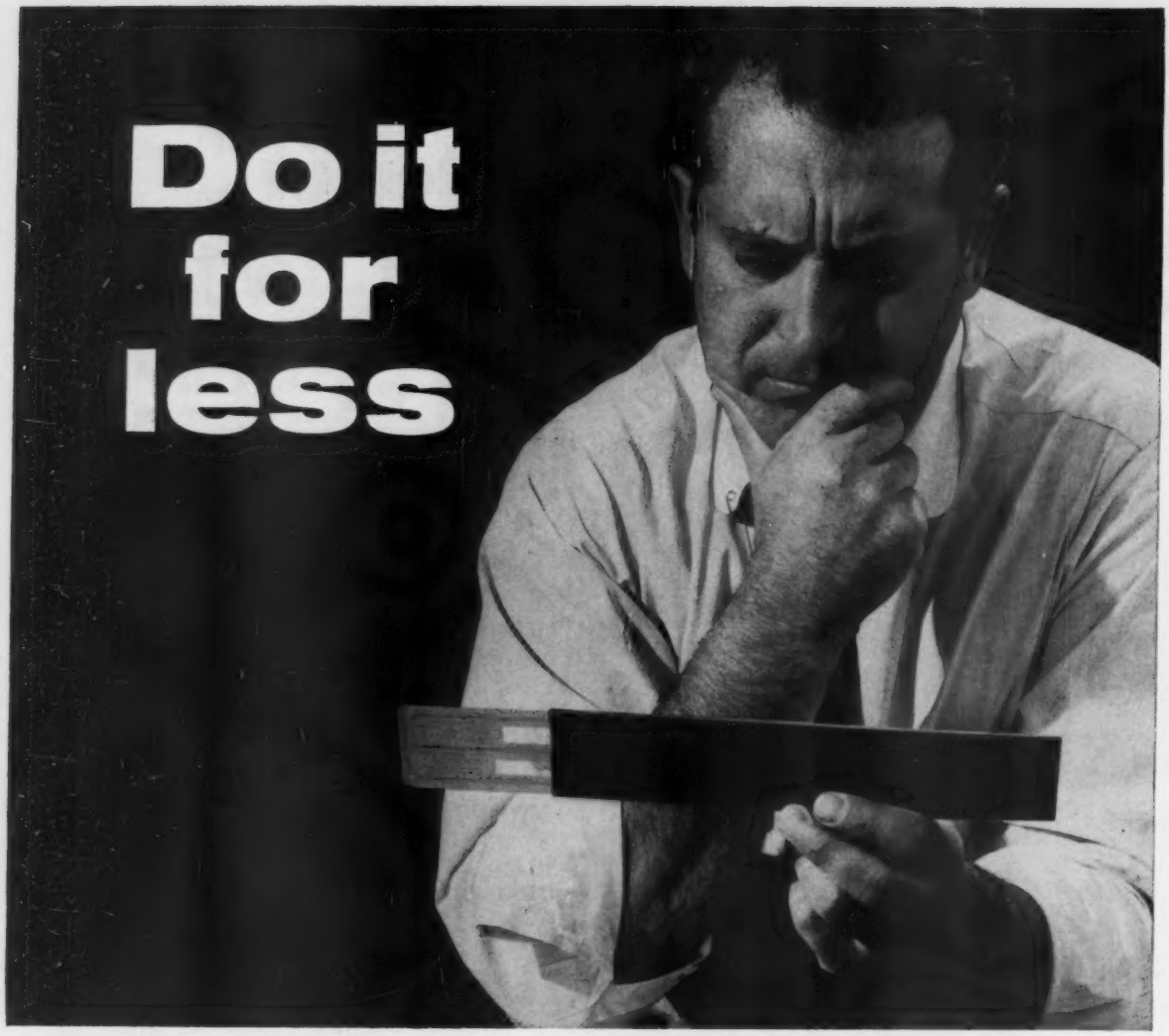
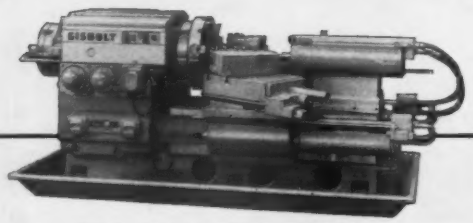
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN



ON A GISHOLT AUTOMATIC CHUCKING LATHE



Gisholt Masterline No. 24 automatic production lathe

Rugged, versatile lathe for large parts—ring and bevel gears, bearing races, pellet mill forgings, oil country parts, diesel cylinder liners and heads.

Swing—35¾"...36" between centers...Up to 125 hp motor for maximum metal removal with carbides.

Single- or multiple-pass JETracers add versatility, cut setup time and tooling costs.

Ask for Catalog 1213

No matter how it's figured, old lathes can't compete with modern automatics. Low metal removal rates —wasted manpower—high maintenance—all cut into profits.

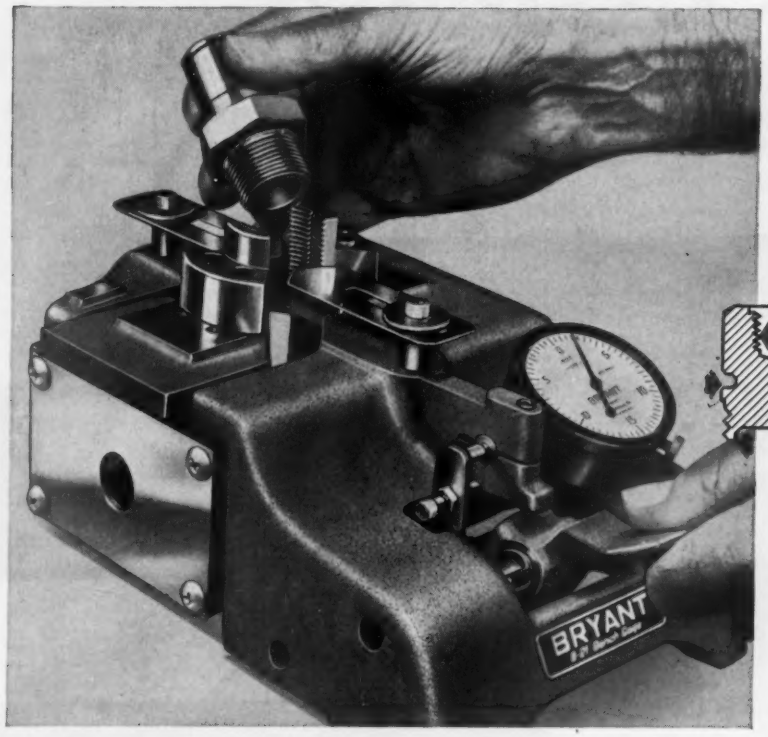
Lot sizes are no longer the deciding factor. JETracers and new, faster setup methods make today's automatic practical for long or short run operations. To meet your needs, Gisholt now offers six automatic turret lathes and four single spindle automatics.

Ask your Gisholt Representative to show you how the *right combination* will give you peak efficiency on first and second operation work and cut your manpower requirements in half!

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

All these checks . . . with one Bryant Gage!



CHECKS THREADS, GROOVES AND BORES—Bryant B-21 Bench Gage checks parts with special grooves, snap-ring or O-ring grooves, or ID and OD threads in all classes to 5″ diameter—and does it 8 to 10 times faster than other methods! Stationary and movable gaging segments end the need to thread parts onto gage.

CHECKS SQUARENESS-OF-FACE—With optional Squareness-of-Face Attachment, the B-21 simultaneously checks thread size and true face run-out in relation to thread axis. Two models: One for parts up to 2″ face diameter, one for parts to 7″ face diameter. Attaches in seconds to the B-21 Gage.

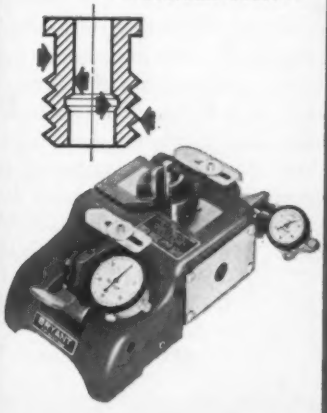
CHECKS ID CONCENTRICITY—Attachment A-9100-B quickly converts the B-21 to check concentricity of bores, grooves or special internal recesses in relation to OD threads or plain OD surfaces of parts up to 8″ diameter with up to 5″ nominal thread size.

AND MORE—See your Bryant Gage Representative, or write for prices, engineering data, and bulletins on the standard and special accessories that make the Bryant B-21 Bench Gage indispensable to quality control throughout industry.

STANDARD B-21 GAGE

SQUARENESS-OF-FACE

I. D. CONCENTRICITY



61-42-B

EX-CELL-O FOR PRECISION

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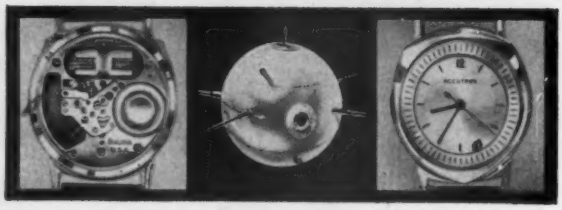
EX-CELL-O CORPORATION

Greenville Plant, 945 E. Sater St., Greenville, Ohio

THIS IS ACCUTRON†®

† TIME-KEEPING Great interest has been focused on the new Bulova ACCUTRON timepiece, a watch described by Bulova as "the first instrument of the space age you can wear and use! . . . It doesn't even tick. It hums! First timepiece guaranteed accurate on your wrist." "Accutron" is Bulova's trademark for timekeeping devices. It stands for new standards of accuracy.



® GAGING We welcome Bulova's use of the word "Accutron" as a compliment to the term already distinguished in the field of precision measurement. "Accutron," a Sheffield trademark for gaging devices, has long been a symbol of unquestioned accuracy and reliability. The Sheffield Accutron amplifier, for example, can show dimensions down to two and a half millionths of an inch, and is readily adaptable to an almost unlimited range of electronic gaging heads and tooling, for checking almost any dimension, shape, or relationship. Feathertouch gaging heads (with pressures as low as 5 grams) permit reliable measurements of soft or easily distorted parts. Accutron instruments are in constant service in Sheffield's own Eli Whitney Metrology Laboratory.

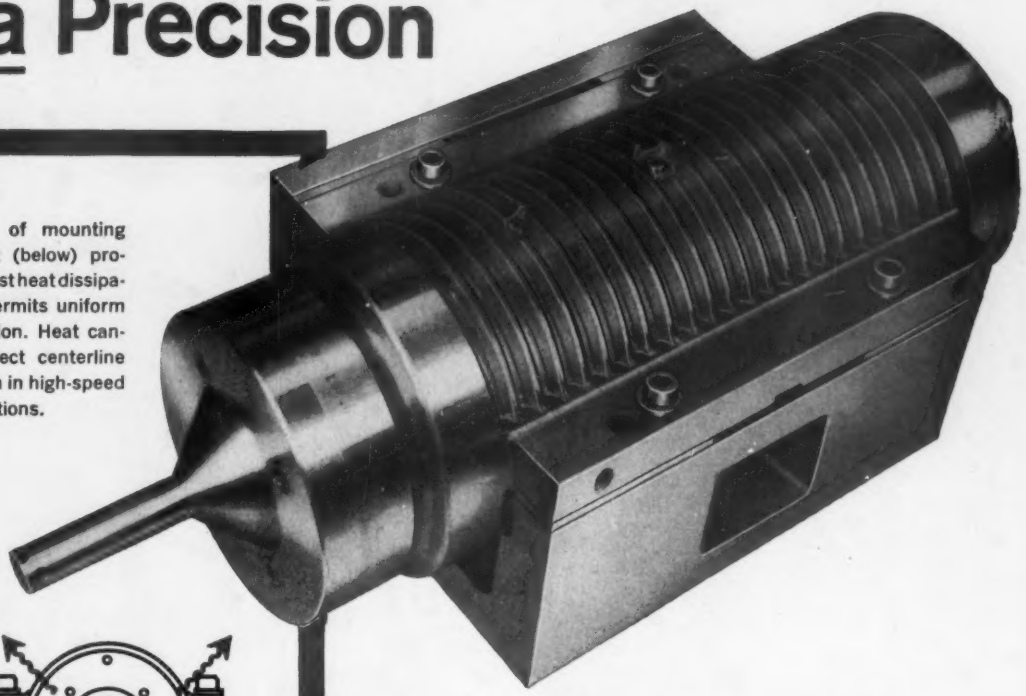
Your Sheffield representative can give you prompt competent technical assistance in any phase of your gaging needs. Write for the Sheffield catalog on ACCUTRON gages and accessories.

The **SHEFFIELD** *Corporation* *Dayton 1, Ohio*

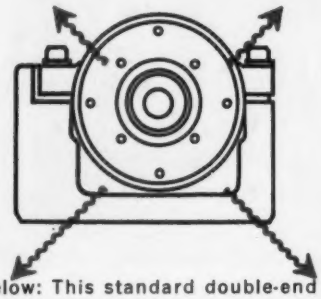
A subsidiary of The Bendix Corporation

Inspection Gages, Dimensional Control Instruments, Machine Controls, Automatic Gaging & Assembly Systems, Measuray® X-Ray Thickness Measuring, Crushtrue® & Multiform® Grinders, Cavitron® Ultrasonic Machine Tools, Press-Pacer® Transfer Units, Large Dies, Tooling, Contract Manufacturing.

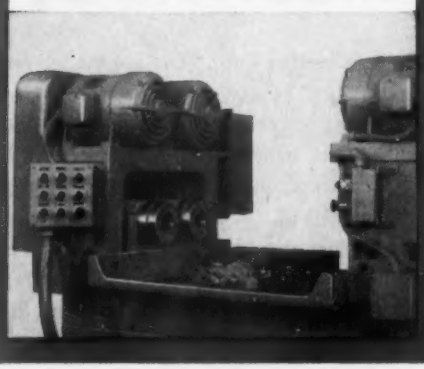
NEW Ex-Cell-O Spindles for Ultra Precision



Design of mounting bracket (below) provides fast heat dissipation, permits uniform expansion. Heat cannot affect centerline position in high-speed applications.



Below: This standard double-end Ex-Cell-O Precision Boring Machine provides a steady platform for the ultra-precision boring job described at right.



The special spindle shown above is one of 16 identical Ex-Cell-O Ultra Precision Boring Spindles recently developed for an extremely demanding boring operation.

Customer specifications called for a guaranteed maximum allowable .00003″ on roundness, with a 10 RMS or better surface finish. The spindles Ex-Cell-O delivered have consistently held .00002″ on roundness, with a 6 micro-inch surface finish (and the customer has ordered duplicates)!

Why do the new Ultra Precision Spindles and other standard and special Ex-Cell-O Boring and Grinding Spindles give consistently greater accuracy, finer finishes and longer, trouble-free life?

The answers are: Engineering and production experience (more than 40 years); exclusive design and construction (using famous Ex-Cell-O Spindle Bearings); and job-tailored availability (Ex-Cell-O offers the most comprehensive line of belt-driven, air-driven, motorized and high-frequency spindles available today).

Need fast delivery of Precision Spindles for original equipment or replacement use? Call your Ex-Cell-O Representative today, or contact Ex-Cell-O in Detroit.

60-85

EX-CELL-O FOR PRECISION

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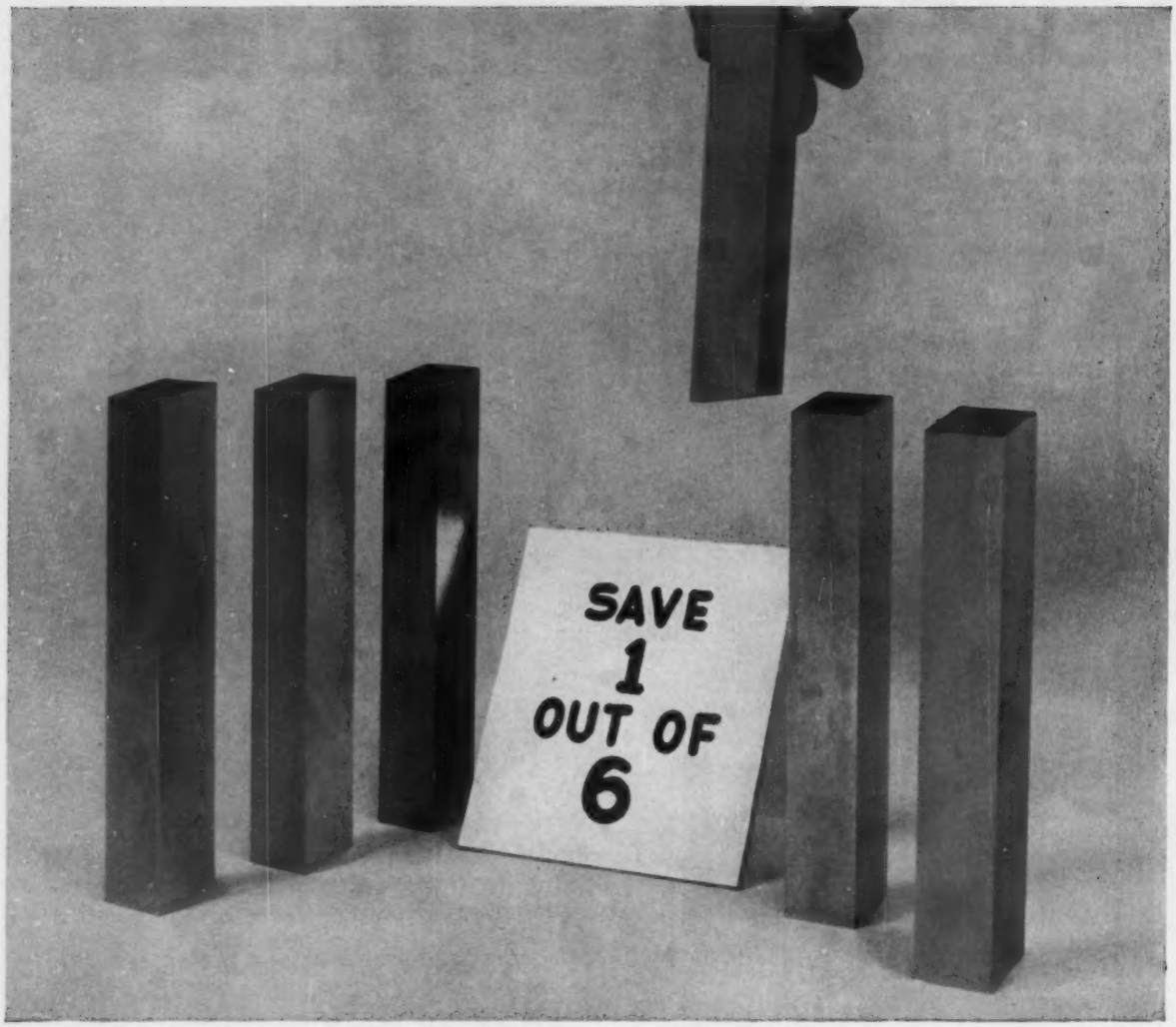
Machinery Division

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN



INCREASE TOOL LIFE AS MUCH AS 20%

Read how a "Cleartex Cure" ends the cutting oil dilution problem forever . . . increases tool life . . . slashes per-piece production costs as much as 40%.

Lube oil may be leaking into your cutting oil sumps this very minute. Surveys show it happens in 70% of all automatics. This dilution will reduce tool life, increase downtime, and result in premature discarding of cutting oil.

How a "Cleartex Cure" works. A "Cleartex Cure" checks these losses right away . . . prolongs tool life as much as 20%. Here's why: Cleartex Oil--heart of a "Cleartex Cure"—is used in both cutting and lubricating sumps. Cutting oil strength is always full—regardless of leakage. Over-all savings can slash per-piece production costs as much as 40%. Versatile Cleartex is a hydraulic fluid, too. *In fact, it's the tri-purpose cutting oil.*

How to take a "Cleartex Cure." Getting the full benefit of a "Cleartex Cure" is easy. An experienced Texaco engineer will survey your automatic set-up. He'll tell you which machines will benefit from Cleartex. Our illustrated booklet, "Cleartex in Automatic Screw Machines," spells out the benefits of a "Cleartex Cure" in detail.

To get the booklet, plus the survey, contact the nearest of the more than 2,300 plants distributing Texaco Products, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. AM-111.

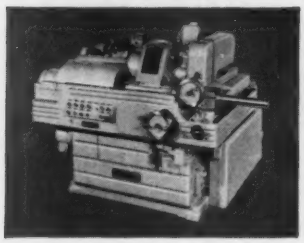
Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

TEXACO

Throughout the United States
Canada • Latin America • West Africa

THREAD GRINDING COSTS TOO HIGH?

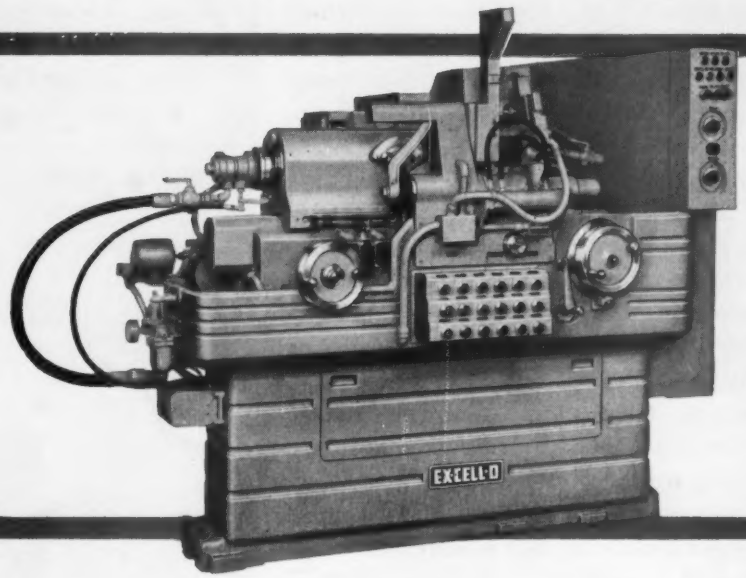
Here's How a Modern Ex-Cell-O can Increase Production and Lower Your Labor Costs



1939—Style 39 Ex-Cell-O Internal Thread Grinder, then the fastest of its kind, produced 17 automotive steering gear ball races per hour. It had power wheel dresser, automatic dresser compensation and automatic wheel feed.

1946—The part's the same, but the manufacturer has turned to a postwar Ex-Cell-O Style 39-A Precision Thread Grinder with fully automatic grinding cycle, including automatic wheel dressing at predetermined intervals. Operator simply loaded the part, reset the size handwheel and pressed the start button. Production increased to 24 parts per hour.

1960—Modern Style 39-A, today produces the same basic part but now at a rate of nearly 60 parts per hour. This powerful, versatile machine has a high-speed workhead, high-frequency Bryant Grinding Spindle, automatic loading, unloading and cycling. It requires only the part-time attention of one unskilled operator.



TOMORROW—Will you have a similar long-run part, or perhaps pinions, worms, taps, thread gages, lead screws, missile components or other special parts that cannot be rough- or finish-ground economically on your present equipment?

Your local Ex-Cell-O Representative can show you how modern Ex-Cell-O Precision Thread Grinders can substantially reduce the cost of producing a wide variety of your large and small threaded parts. Call him today, or write direct for details on the complete line of Ex-Cell-O Internal, External and Universal Thread Grinders for every toolroom and production job.

60-35

EX-CELL-O FOR PRECISION

PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • JIG AND FIXTURE COMPONENTS • TORQUE ACTUATORS • CONTOUR PROJECTORS GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Frauenthal reports NEW VERSATILITY for 1200 Series vertical grinder!

PRODUCTION BY THE THOUSANDS... PRECISION TO THE MILLIONTHS

Now available with NEW tracer control or numerical control... infinitely variable feed and speed ranges!

Frauenthal's flexible 1200 Series single-spindle vertical grinder permits *precision to the last millionth* on contour pieces, yet can be engineered to provide mass production grinding when required.

A new electro-hydraulic tracer control system affords super-precise accuracy. Completely transistorized for compactness and a new high degree of control reliability, the ultramodern tracer system guides the vertical and horizontal axes simultaneously through 360° of motion. Any variation from true contour path is immediately indicated on a continuous recorder which also gives a permanent record of contouring accuracy.

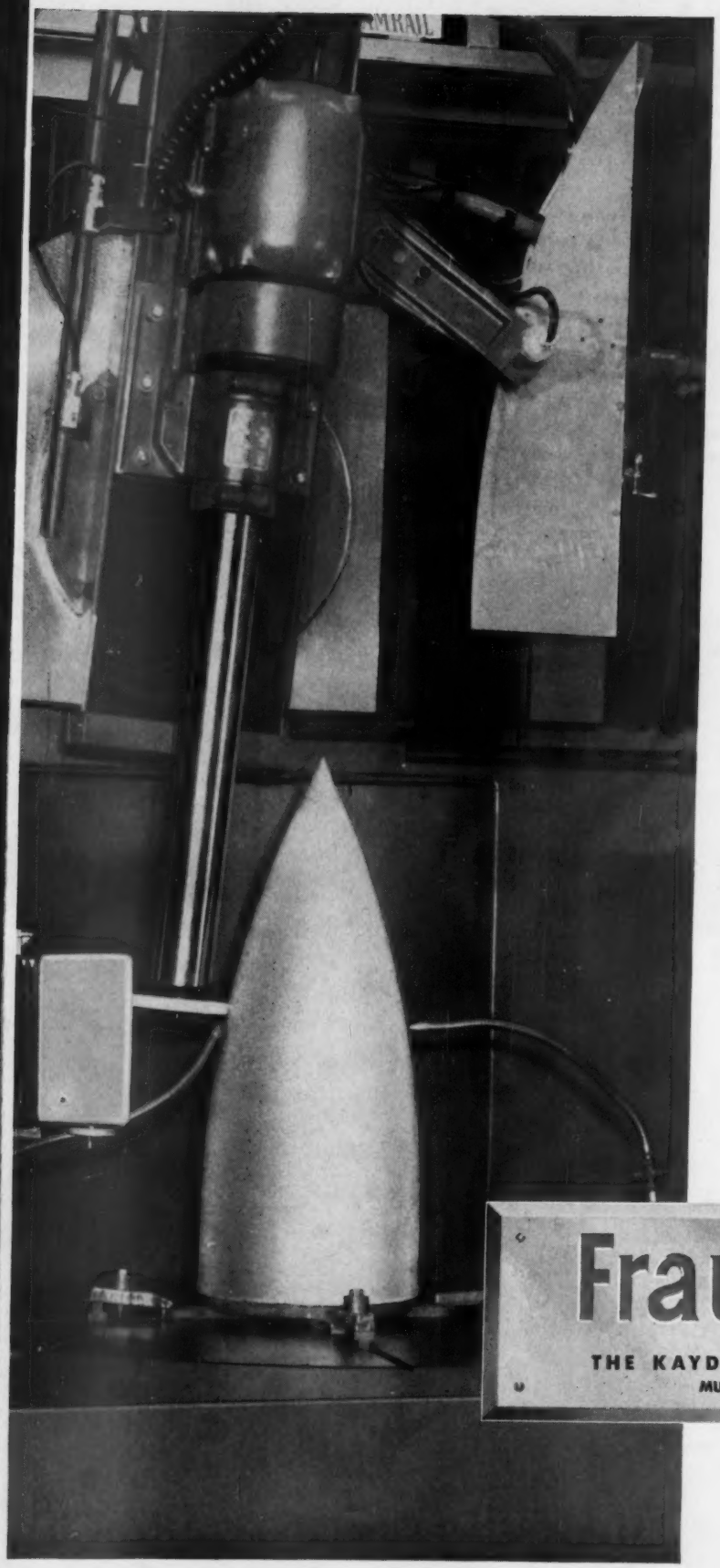
Numerical control allows continuous path or discreet positioning, and is particularly applicable for a variety of grinding operations on a low-cost repetitive basis.

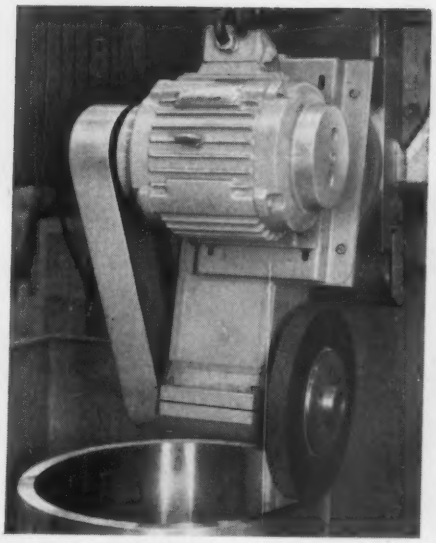
Infinitely variable feed and speed ranges with widest possible working range are available. Direct-current drive with potentiometer control assures accurate variable worktable speed.

The 1200 Series' vertical design eliminates deflection inherent in horizontal grinders. This design also substantially reduces floor-to-floor time, since parts are loaded easier, centered faster and can be simply, quickly checked.

For complete details on this creatively engineered single-spindle vertical grinder, write for the new Frauenthal 1200 Series bulletin.

There are two 1200 Series models, with table diameters from 24" to 42" and nominal swings of 36" to 48".





Here is the right-angle spindle attachment for rotary surface grinding — another new Frauenthal development for use with the 1200 Series grinder.

Designed and built in the U.S.A. You get American quality when you buy Frauenthal.

Frauenthal

DIVISION

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U.S.A.

LEBLOND
2518
TAPE-TURN

First from LeBlond

Continuous-Path Tape Controlled Lathes

Talk to LeBlond about Tape-Turn lathes. You'll be talking about machines we've got on the run off floor rather than on the drawing board. We're delivering at least six months ahead of competition. Our experience can help you get an important edge on *your* competition.

Tape-Turn is being built with 20 to 75 hp in sizes from 2013 to 4025.

100% tape commanded by G. E. Mark Century control—*all* operator controls at the console—solid state components (no tubes, stepping switches or rotating parts)—temperature and humidity controlled—built-in computer for linear and circular interpolation.

Benefits

Increased efficiency and management control, reduced lead time, a permanent record in easily-stored form, low-cost quality control, reduced parts inventory, shorter set-up time and lower tooling costs.

Ask to have a LeBlond field engineer stop and talk Tape-Turn, the machine on the floor instead of the drawing board. Or write for our new descriptive bulletin TT-1061 A.

The R. K. LeBlond Machine Tool Company
Cincinnati 8, Ohio

Leading the way in numerically-controlled turning.

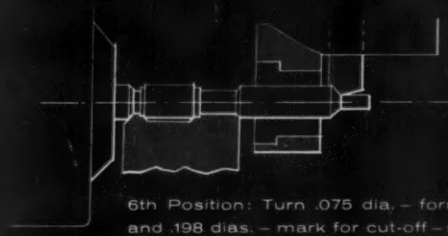
LeBLOND of Cincinnati

CIRCLE 314 READER SERVICE CARD

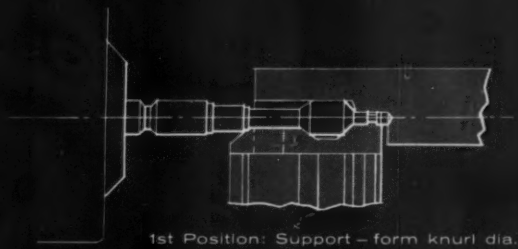
Acme-Gridley Speed & Accuracy...

SLASHES TOTAL MACHINE TIME 76.4%

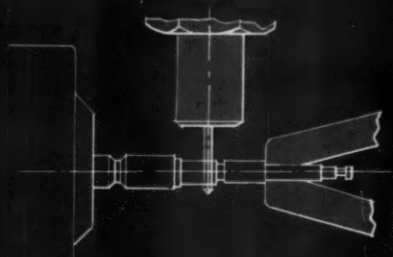
for E.F. Johnson Company



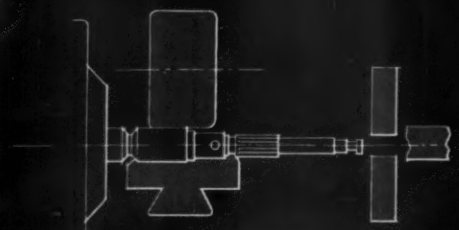
6th Position: Turn .075 dia. – form .165 and .198 dias. – mark for cut-off – support



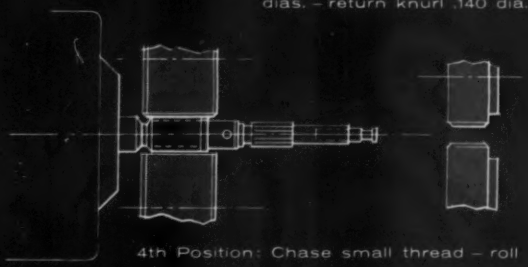
1st Position: Support – form knurl dia., .055 and .075 dias.



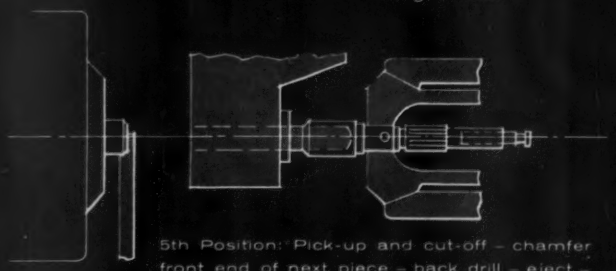
2nd Position: Stop spindle – cross drill – hollow-mill small thread dia.



3rd Position: Start Spindle – shave large thread dia. and .198, .165, .140 and .130 dias. – return knurl .140 dia. face end



4th Position: Chase small thread – roll large thread



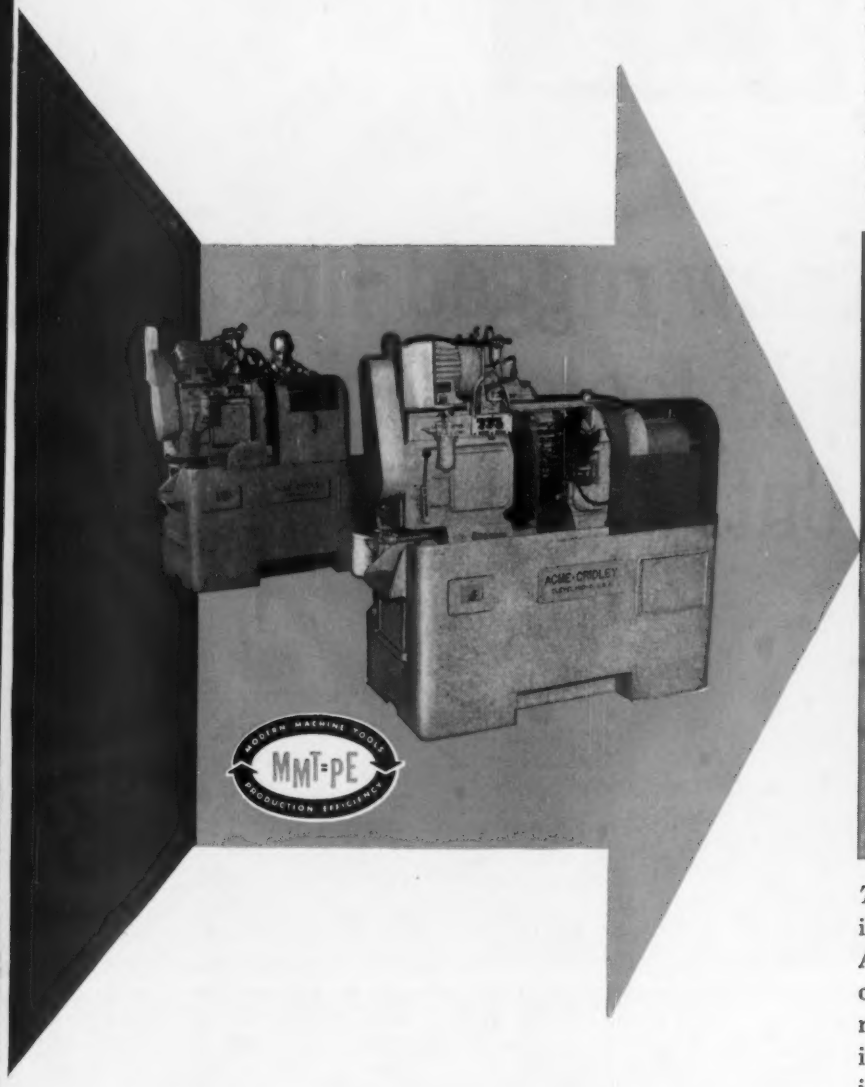
5th Position: Pick-up and cut-off – chamfer front end of next piece – back drill – eject – chamfer front end

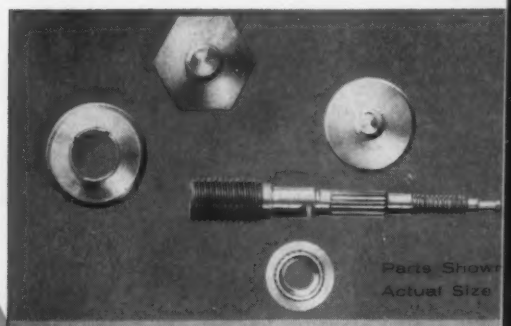
Total Machine Time – 5 Seconds

CIRCLE 315 READER SERVICE CARD

. . . also . . . cost-per-piece is substantially reduced . . . part uniformity and quality definitely improved . . . scrappage all but eliminated.

This is the *record* of two Acme-Gridley 7/16" RA-6 Spindle Bar Automatics installed at the E. F. Johnson Company, Waseca, Minnesota. Producing some 15 intricate parts, like those shown, the rugged and versatile Acme-Gridleys continually meet the rigid specs of this well-known manufacturer; help make high quality products such as the Viking Messenger Citizen's Band two-way radio available at prices that fit the public's pocketbook.





Tangible production savings, like those realized by E. F. Johnson, are assured with Acme-Gridleys. In your plant, the 7/16" RA-6, or any of the world's most complete line of multiple-spindle automatic bar and chucking machines will show you a new dimension in mass production efficiency.

National Acme

The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

CIRCLE 316 READER SERVICE CARD

Now! A new rugged line of versatile foot switches from Cutler-Hammer

Smartly styled... four types... designed to be used many different ways

Now you can get the same high quality in foot switches you find in Cutler-Hammer motor starters.

Our new foot switches are designed to be stepped on, kneed, elbowed, palmed or whatever method you can think of to use them. Heavy gauge metal and rugged construction will keep these switches operating long after others have failed.

You get versatility, too. The heavy duty, side treadle switch has three interchangeable operating arrangements that can be made easily in the field by just changing the position of a nylon cam, and all are styled alike to give you uniformity in appearance.

Be sure to get full details from your Cutler-Hammer distributor and send for Pub. LO-91-S239.

What's new at Cutler-Hammer?
We've geared up for the great growth of technology coming in this decade... with new, better products like the foot switches, new engineering talent, new plant facilities. If you're planning ahead, let's get together. Maybe we could help you with your electrical control and automation plans. Get in touch with the Cutler-Hammer Sales Office nearest you.

WHAT'S NEW? ASK...

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Cutler-Hammer Canada, Ltd.; Cutler-Hammer Mexicana, S. A.

HEAVY DUTY SIDE TREADLE OPERATED FOOT SWITCH

Most versatile foot switch you've ever seen. Just by changing the position of a nylon cam, you can change the operation of the switch on the job. Comes with four nameplates (Start, Stop, Forward and Reverse). Pick the two you want, toss the other two.

HEAVY DUTY TREADLE SWITCH WITH FOOT LOCK Non-slip tread helps keep operator's foot from slipping. Available with several types of guards. Locks when depressed, opens when red release is touched.

HEAVY DUTY PALM-TYPE SWITCH Big orange surface easy to see. Rated for 600 volts maximum. Neoprene gasket stays flexible, resists effects of oil.

STANDARD DUTY TREADLE-OPERATED FOOT SWITCH Use it for a knee operation. Has a rating of 600 volts maximum. Three mounting bosses permit mounting on uneven surfaces without rocking.

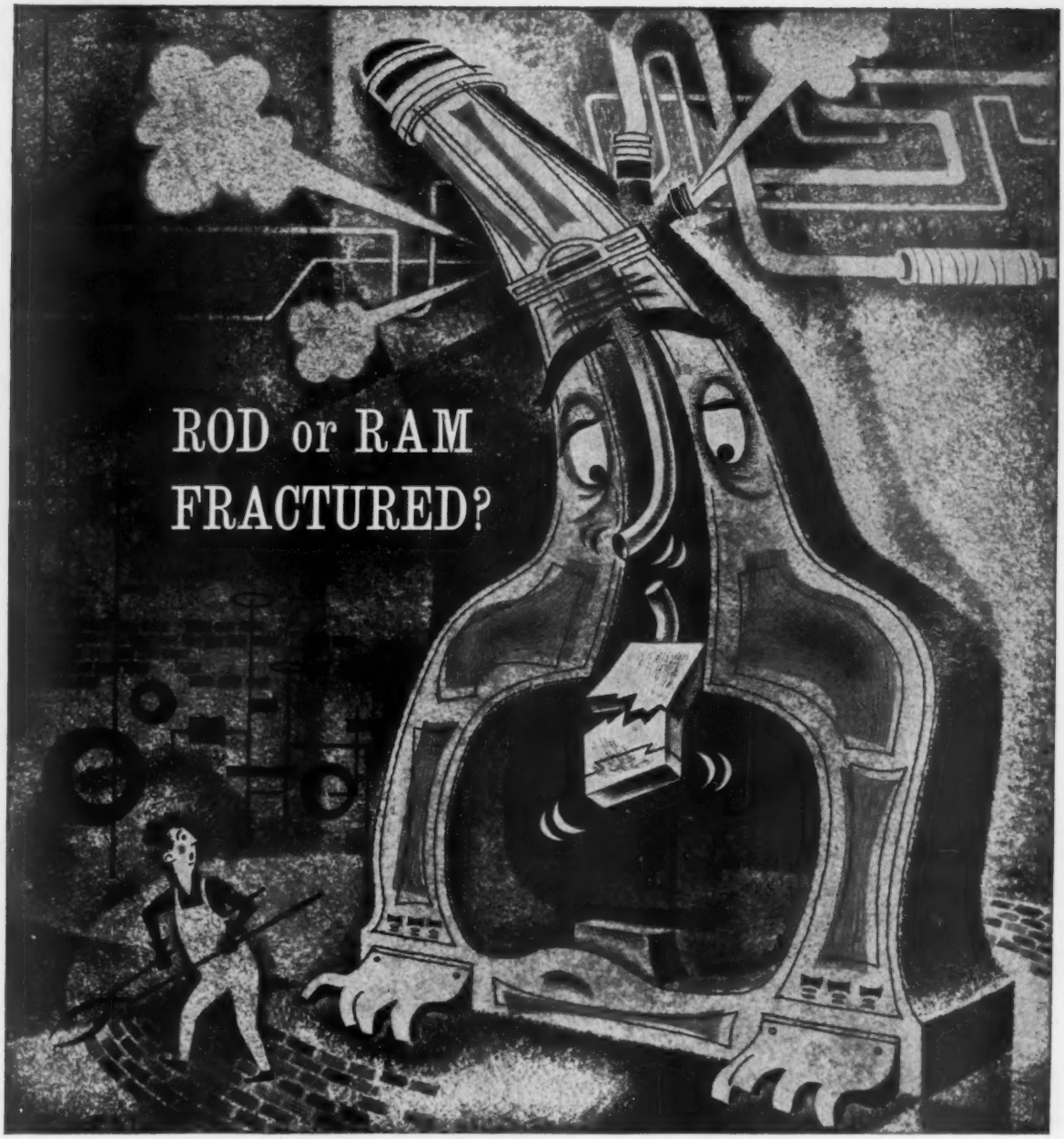
NOW...ROUGH GRIND AND FINISH WITHOUT CHANGING DISCS

• • • get up to 20 times longer life with new flexible MX® Discs.

Now you can end forever the costly, time-consuming annoyance of changing discs between roughing and finishing. To take off metal rapidly with the new flexible MX® disc, simply bear down—watch the disc hug the workpiece as it grinds off stock. Then let up and finish the job with an easy smooth motion—all with the same disc! Use this remarkable new abrasive tool on flat work or on contours. Use it to remove welds, take out dents and imperfections—for hundreds of jobs on regular steel, stainless or aluminum. Your Carborundum distributor or representative will be glad to help.

Bonded Abrasives Division • Niagara Falls, N. Y.

CARBORUNDUM



Call ERIE FOUNDRY for forging hammer replacement parts to your specifications

Replacement rods and rams, and many other parts for a wide variety of forging hammers of most any make are available from Erie Foundry. They are high in quality, competitive in price.

For over 65 years Erie Foundry has specialized in the design, development and manufacture of forging hammers of all types. Logically, then, Erie Foundry is a sure source for repair parts equal in quality and performance to the original equipment. Substantial inventories assure you of prompt service.

For more information on repair parts or our complete Rebuilding Service, write Mr. James Walker.

ERIE

ONE OF THE GREAT NAMES IN FORGING SINCE 1895

ERIE FOUNDRY CO., Erie, Pa.

Manufacturers of Forging Hammers • Forging Presses • Hydraulic Presses • Trimming Presses

EF-60-01

When the job calls for MICRO-PRECISION put it on a Wade Variable Speed HAND TURRET or FINISHING LATHE...

- Turn to a 5 finish
- Turn round to 25 millionths
- Hold concentricity .0002" on 5 or 6 diameters
- Perform 7 distinct operations at one chucking
- 1 1/16" or 2 1/4" collet capacity
- One-second cycle with a standard motor through electric clutch drive
- Variable speed from 140 to 3500 RPM by push button control

NOW MANUFACTURED, SOLD AND SERVICED BY

OVEL MFG. CO.
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Send today for full details — Dept. A91.

CIRCLE 321 READER SERVICE CARD

LETTER from the PUBLISHER

Why Be A Pass-Along?

If you are a subscriber to AMERICAN MACHINIST/METALWORKING MANUFACTURING, don't read this. If you are not a subscriber but receive a routed copy of the publication, this is for you.

That guilt feeling . . .

Have you ever had that feeling of guilt when you receive that "pass-along" copy of AM/MM? Perhaps you are the second or third man on the routing list but there are three or four more listed after you. You want to read the issue. You want to be sure not to miss anything of importance that you can use in your job. You don't have the time to read the issue *right now*. Perhaps you hold it a day or two. You still haven't read everything you'd like to read. But your conscience gets the best of you. You just cannot deprive the next man on the routing list of the opportunity to stay up to date on the latest developments. So you check off your name and put the publication in your out-basket. You promise yourself you'll get back to that issue so you can be sure you missed nothing of importance, but you never do. And that guilt feeling persists.

An easy solution . . .

The solution is obvious: enter your own personal subscription to AMERICAN MACHINIST/METALWORKING MANUFACTURING. The price is modest: $3 a year. You can do this easily by checking off the square at the bottom of the reader service card and mailing it today or sending in the subscription order card bound into this issue. With your own subscription you won't have that twinge of conscience and you can read your copy at home where you can concentrate on what's in it. And *Mr. Subscriber*, if you too have read this far, the fewer people who read your copy, the more certain you will be that it is handily located, right at your elbow for easy reference.

George Reppert

free analysis of your tape requirements

point-to-point or continuous path positioning

dial-in control of 2 axes, or tape control of 2, 3, or 4 axes

tape control of all speeds, feeds, depth, and clamping

exclusive Di-Matric controls provide infinite machining cycles

tape-revolved tables with infinite positions or radial feeding

automatic power tool lock with hardened and ground taper

automatic tape controlled tool changers available

all drive screws in center of guideways for best accuracy, least wear

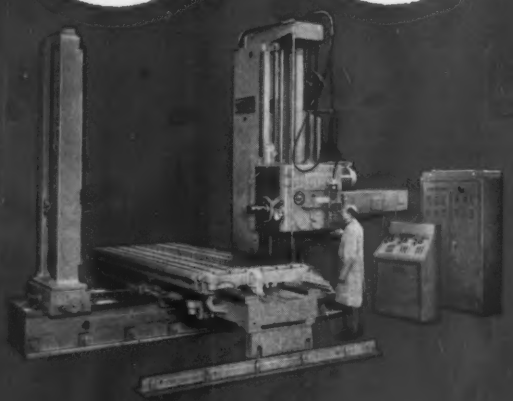
tape is read during positioning; no delays

simple switching from tape to pendant controls

heavy-duty, rigid structural design

repeatability within plus or minus .0001"

wide range of sizes, both table or floor type



14 reasons to consider tape-controlled Gilberts

Summarized here are the main reasons you should consider Cincinnati Gilbert's numerically-controlled 4" and 5" horizontal boring mills. We suggest a letter or phone call for complete information—or, better yet, a visit to the plant to see an actual demonstration. The Cincinnati Gilbert Machine Tool Co., 3366 Beekman Street, phone Kirby 1-4815, Cincinnati 23, Ohio.

GILBERT

holes we had nothing to do with

L&I reamers are **not** used in donut making. But almost any place else in the metalworking field, chances are you'll find L&I reamers used for precision finishing and sizing of holes. L&I offers you **the most complete line of reamers** including miniature sizes, wire gage sizes, letter sizes, dowel pin reamers, fractional reamers by 64ths, all in both straight and spiral flutes. This means lower first cost . . . greater efficiency . . . increased production . . . and more savings per reamed hole.

FREE! A POCKET CHART OF DECIMAL REAMERS. See your L&I distributor or write today.

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LAVALLEE & IDE, INC.
"THE REAMER SPECIALISTS"
CHICOPEE, MASSACHUSETTS

LETTERS

to the editors

330 W 42nd St, New York 36, NY

Zinc Coating Material

Dear Sirs:
Will you please send us the complete address of the Galvicon Corp, Brooklyn, NY, which was mentioned in your "Metalworking Report" (*AM/MM*—July 24 '61, p2)?

L W Struensee
Oshkosh, Wis

For further information on Galvicon's coating material, write to Mr C Curow, sales manager, Galvicon Corp, 20 Meadow St, Brooklyn, NY—Ed.

Flash of Genius Not Needed

Dear Sirs:
In Albert Woodruff Gray's article, "When is a patent valid?" (*AM/MM*—June 26 '61 p84), only a 1947 lower-court decision is cited in support of the proposition that a "flash of creative genius" is not required to show invention in a novel and useful process.

Mr Gray might better have cited Section 103 of the 1952 Patent Act, which reads (in part), "Patentability shall not be negatived by the manner in which the invention was made."

In the report of the Congressional committee dealing with this section, as reprinted in the *Journal of the Patent Office Society*, August 1952, this sentence is further explained: "it is immaterial whether it [the invention] resulted from long toil and experimentation or from a flash of genius."

Thus, the Supreme Court's requirement in the *Cuno* case for a "flash of genius" must be considered totally discredited by the later development of the patent law. It may not be clear what is required to show invention, but certainly a "flash of genius" is not.

J W Linkhauer
Pittsburgh, Pa

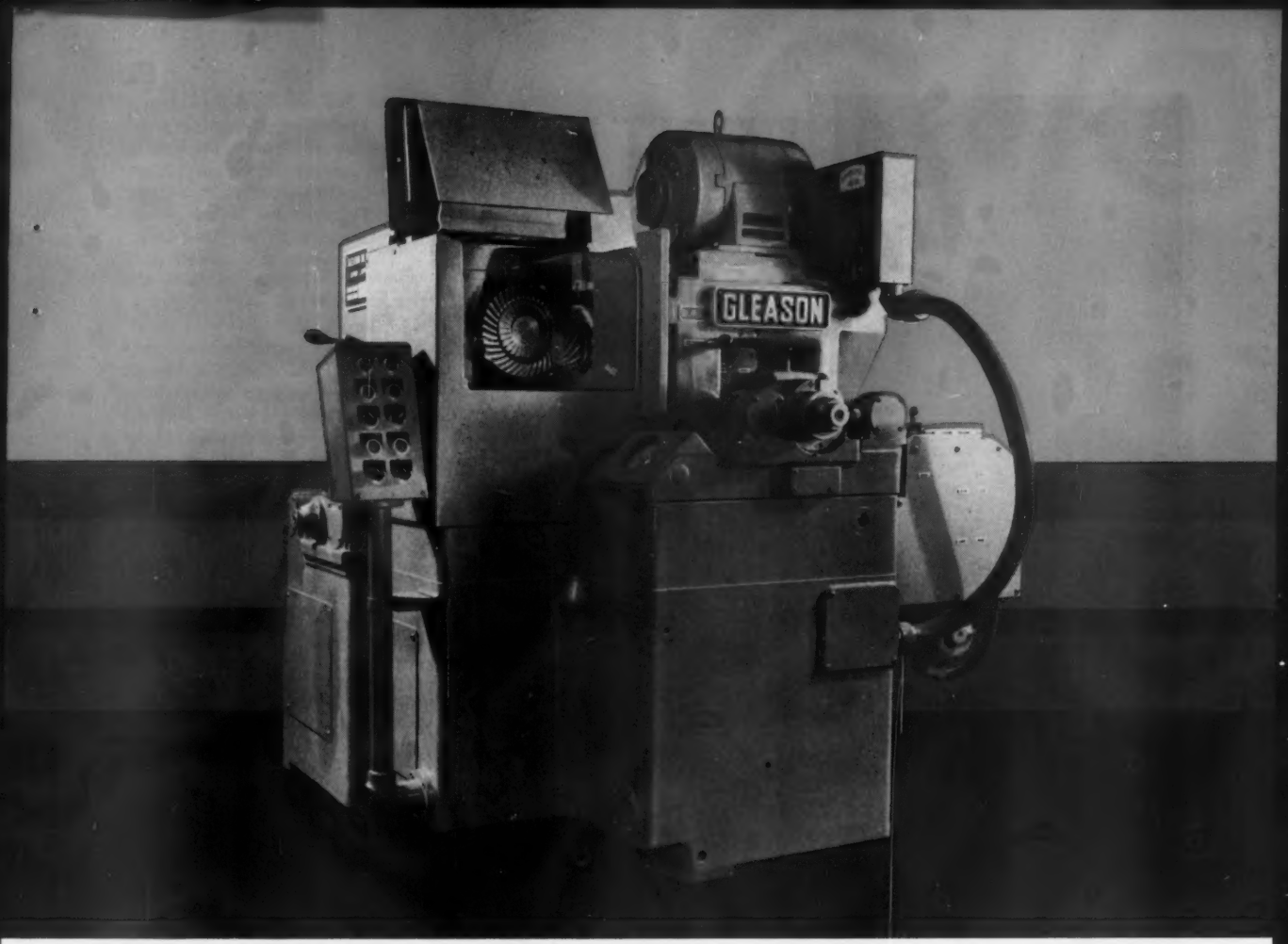
Elastic Plastic for Dies

Dear Sirs:
In your May 1 issue there is an article on "Elastic incompressible p'astic makes cheaper dies" (*AM/MM*—May 1 '61, p74).

As we are in the jewelry and stamping business, punching and

SHOPMATES

N. Jarvis



New "Swing Pinion Cone" concept basic in Gleason No. 503 Hypoid Lapper

SPC is a completely new concept in the lapping of spiral bevel and hypoid gears. With this method, improved refinement of tooth surfaces is obtained, resulting in quieter, smoother-running gears.

SPC is accomplished on the No. 503 Hypoid Lapper by actually pivoting the pinion member in a horizontal plane about a point that is the approximate center of the tooth mesh. This motion, combined with a corresponding horizontal movement of the pinion member during the lapping cycle, moves the contact uniformly over the entire tooth surface to insure complete lapping.

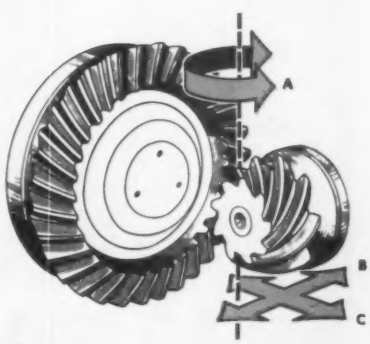
Previously prolonged lapping has been a major problem. However, extended tests have conclusively proved "prolonged lapping" with SPC does not have a major effect on the tooth contact pattern or tooth shape. This feature removes the problem of decreasing the amount of pinion axial adjustment during assembly.

Completely Automatic Cycle. Once the correct lapping cycle is established, all of the motions are completely automatic. Complete control of the lapping cycle, including such features as faster lapping time, independent lap of coast and drive side and proper backlash, are independently set through a convenient "dial-in" system.

Faster Production. An increase of approximately 20% productivity is obtained on the No. 503 Hypoid Lapper employing SPC.

The No. 503 Hypoid Lapper is a high production lapper, intended for automotive or custom gear shops, and accommodates 90° shaft angle gears up to 10" in diameter. The No. 504 Hypoid Lapper, our larger model, will handle gears up to 36" in diameter. Shaft angles on this machine can be extended to a 10°-160° range.

For more information and specifications, please write for technical bulletins.



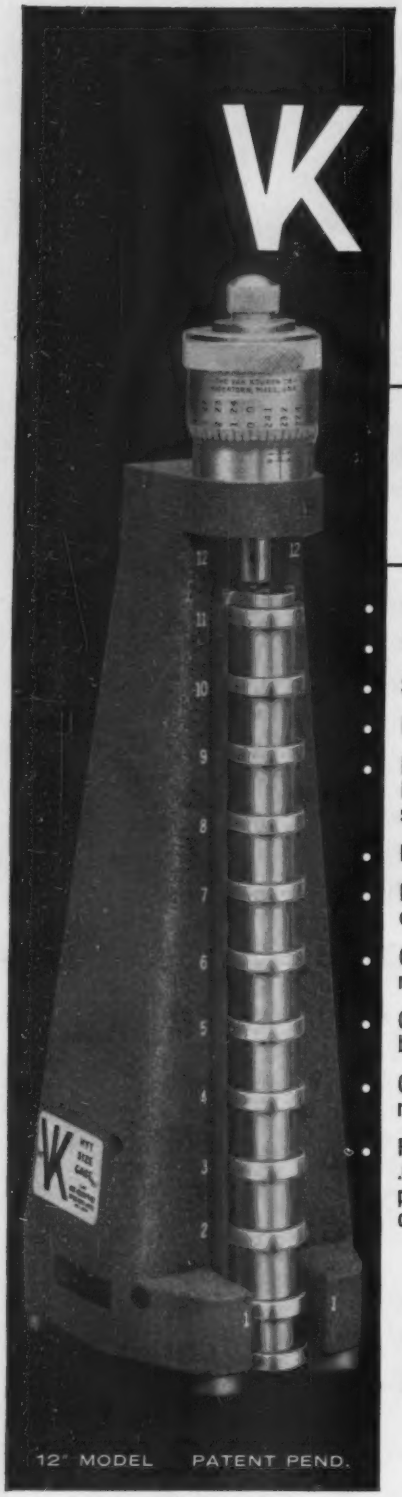
SPC LAPPING MOTIONS: The swing motion of the pinion head (A) moves the bearing along the length of the tooth. The axial motion of the pinion head (B) moves the bearing up and down the tooth profile, while the motion of the pinion head in the direction of the gear axis (C) maintains constant backlash.

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

92

CIRCLE 324 READER SERVICE CARD



NEW VK HYT SIZE GAGE

A DIMENSIONAL GAGE FOR SETTING ANY DIMENSION FROM 1/4" to 12" in .0001" Steps

- Embodies VK Precision
- Decided price advantage
- Speeds up dimensional set ups
- Fifty Millionths accuracy over range
- Exclusive design — eliminates backlash — 180° accessible measuring surfaces — can be used horizontally
- Rugged — long life
- Easily portable — use it at all checking points in the shop
- Over and under readings at one-inch measuring spaces
- Chrome plated shaft rides in hardened bushing, minimizing wear
- Gage block accuracy lapped into all measuring faces
- Precision micrometer graduated in .0001" — Vertical adjustment compensates for wear factor and dimensional control

HYT SIZE GAGE
12" Model No. 61-1
$445.00

THE VAN KEUREN CO.
173 Waltham Street, Watertown 72, Mass.
PRECISION MEASURING TOOLS . . . rated the world's most accurate
• Optical Flats and Light Wave Equipment • Gage Blocks
Precision Lapping Service and Parts • Plug Gages • Measuring Wires
WA 6-1450

forming are our daily bread and butter. Therefore, we are very interested in this new method and want to ask where we can obtain more information, especially where to purchase a sample of this miracle stuff, polyurethane.

Kollmar & Jourdan A G
Pforzhein, Germany

Dear Sirs:
I am very interested in the method and parts you discussed. Would you be kind enough to enlighten me as to where I could see the stainless steel parts described, under actual operation of dies?

R Williamson
Toronto, Canada

Dear Sirs:
Kindly advise whether such plastic dies as outlined in the article . . . can form/draw steel cups and stainless steel utensils. Also, kindly advise which plastic can very profitably be used in making the dies, and whether the plastic dies can be used on power presses.

Jaipur Cycle & Parts Industries
Jaipur, India

Dear Sirs:
We are interested in the forming-die material, po'yurethane, that you mentioned in your article, and . . .

J T Cooper
Anniston, Ala

The best source for additional information and operating details on ElastaCast is Donald H Gardner, vice president and sales manager of Standard Die Set Co, 1520 Elmwood Ave, Providence, R I—Ed.

AM/MM

"What's it worth to me, boss, if I show you the movies I took while you were away?"

CALENDAR

Society of Automotive Engineers —Farm, Construction, and Industrial Machinery Meeting, Sept 11-15, Milwaukee Auditorium, Milwaukee, Wis.

Instrument Society of America—Annual Meeting and Automation Exhibit, Sept 11-15, Memorial Sports Arena, Los Angeles, Calif.

Pressed Metal Institute—Annual Meeting, Sept 24-28, Grand Hotel, Point Clear, Ala.

American Welding Society—National Fall Meeting, Sept 25-28, Adolphus Hotel, Dallas, Texas.

American Die Casting Institute—Annual Meeting, Sept 27-28, Edgewater Beach Hotel, Chicago, Ill.

American Production & Inventory Control Society — National Technical Conference & Exhibit, Sept 28-29, Pick-Congress Hotel, Chicago, Ill.

American Machine Tool Distributors Association—Annual Meeting, Oct 4-6, Penn Sheraton Hotel, Pittsburgh, Pa.

Society of Automotive Engineers —National Aeronautic Meeting and Display, Oct 9-13, The Ambassador, Los Angeles, Calif.

American Standards Association — National Conference on Standards, Oct 10-12, Rice Hotel, Houston, Texas.

Magnesium Association — Annual Convention, Oct 16-18, Belmont Plaza Hotel, New York, N.Y.

National Safety Council — National Safety Congress, Oct 16-20, Chicago, Ill.

American Institute of Mining, Metallurgical & Petroleum Engineers — Metallurgical Society Fall Meeting, Oct 23-26, Pick-Fort Shelby Hotel, Detroit, Mich.

American Society for Metals — National Metal Exposition and Congress, Oct 23-27, Cobo Hall, Detroit, Mich.

Society for Nondestructive Testing — Annual Convention, Oct 23-27, Henrose Hotel, Detroit, Mich.

VALVOLINE

Tectyl

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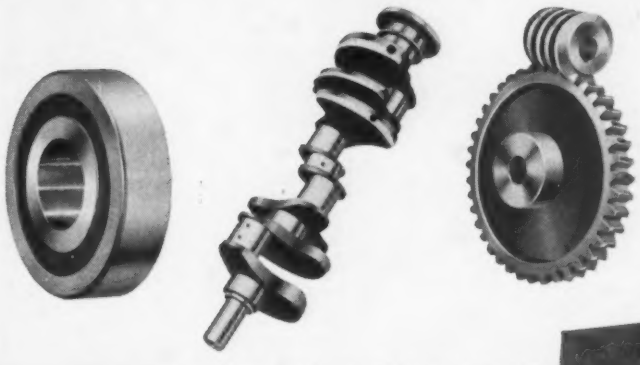

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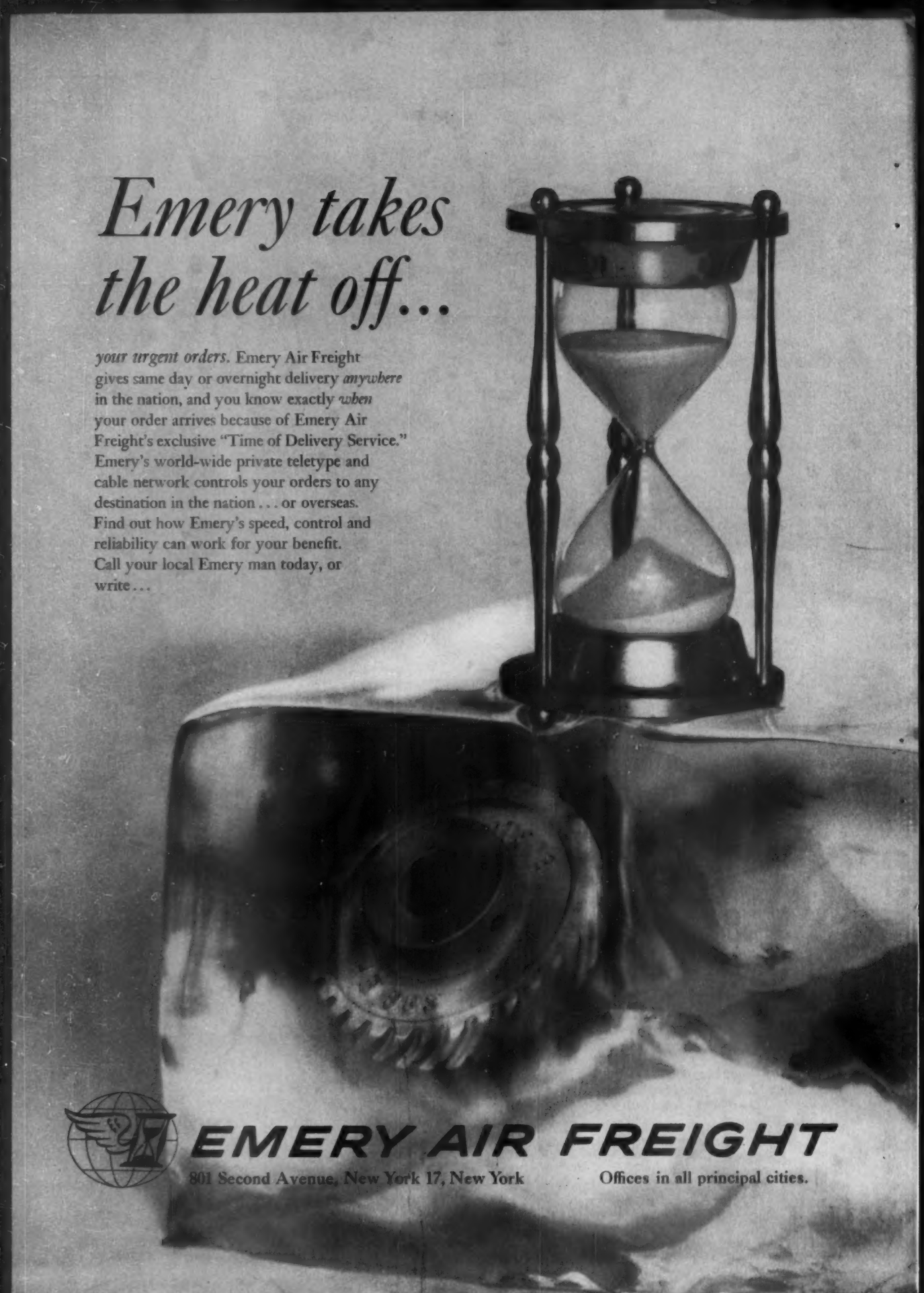
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SPOT NEWS...

- **IAM members at Cutler-Hammer are worried about a Hancock Telecontrol** installed at their plant. Device (*AM/MM*—Apr 7 '58, p130), now being given test runs in the punchpress department at the Milwaukee plant, connects the machines to a production data center. It feeds information on total parts produced, running time, downtime, and provides a direct phone hookup to the data center. Workers fear machine may be used as part of a continual time study process to set new production quotas for the company's incentive program.

- **High-strength, hard ceramic composed of silicon carbide and aluminum oxide** is said to have higher mechanical properties at elevated temperatures than presently available aluminum-oxide materials. Higher density imparts greater wear resistance. In electrical applications, the material can be used either as an insulator or a conductor by varying silicon-carbide percentage. Details are available from Diamonite Products Mfg Co, Shreve, Ohio.

- **Instrument that can measure to within three microinches the roundness,** concentricity, perpendicularity, parallelism or axial alignment of a part has for its critical element a bearing that is said to improve in accuracy with use. Bearing —neither air, fluid, ball or roller, says the maker—defines a reference axis and plane for measurement. Developed by Elliott Brothers (London, England), instrument is designed for workshop and laboratory use.

- **Small Business Administration has awarded a record-breaking number** of government contracts in the first half of 1960. Small company contracts rose to a total of 22,361, almost 70% more than in the same period last year. Dollar value was almost $750 million.

- **Experimental ultrasonic bearing has low drag at start-up and shut-down,** according to its developer, Electro Sonic Systems Corp (Los Angeles). Bearing consists of a 69-gram brass cap bearing mounted atop a ferrite-powered ⅜-in. transducer which functions as the shaft. When 7-watt input is fed to transducer, the resulting ultrasonic energy bombards the air between the shaft and the bearing, thus maintaining an air film.

- **Ferrolite 10, a thinner thin tin plate, has a coating of only 0.1 lb of tin** per base box, compared to the 0.25 lb on U S Steel's original Ferrolite thin tin plate. The original Ferrolite was the first tin plate offered in weights and thicknesses about half that of standard tin plate. New material is priced 15¢ per base box lower than its predecessor.

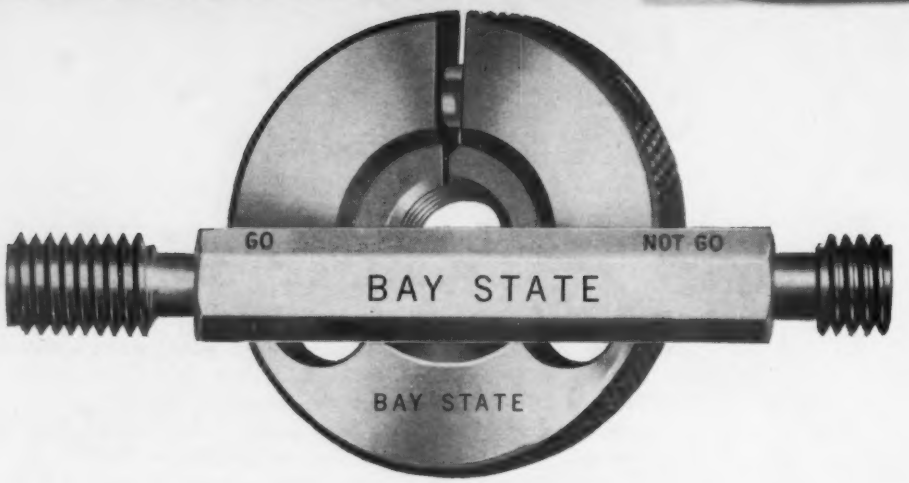
- **Steels that withstand four times as much deformation** and exhibit three times the elongation of convenionally made steels have been developed in Russia, according to a report from the Central Institute of Ferrous Metallurgy. Russians say the secret lies in exposing the molten steel to supersonic vibrations.

- **Italian metalworking industry imported 144.2% more machine tools** in the first half of 1961 than in the first half of 1960. Import volume rose from 6,809 to 16,630 metric tons. Machine tool exports in the same period rose 53.4%, from 8,688 to 13,527 metric tons.

- **725 full-time jobs were created in the U S by the sale** of $10.4 million worth of machinery to Japan by United Engineering and Foundry Co (Pittsburgh), according to testimony presented to the House Subcommittee on the Impact of Imports and Exports on American Employment. The law firm of Stitt and Hemmendinger (New York, NY) presented this data on behalf of several Japanese manufacturers' and exporters' associations.

◄ CIRCLE 327 READER SERVICE CARD

NEW



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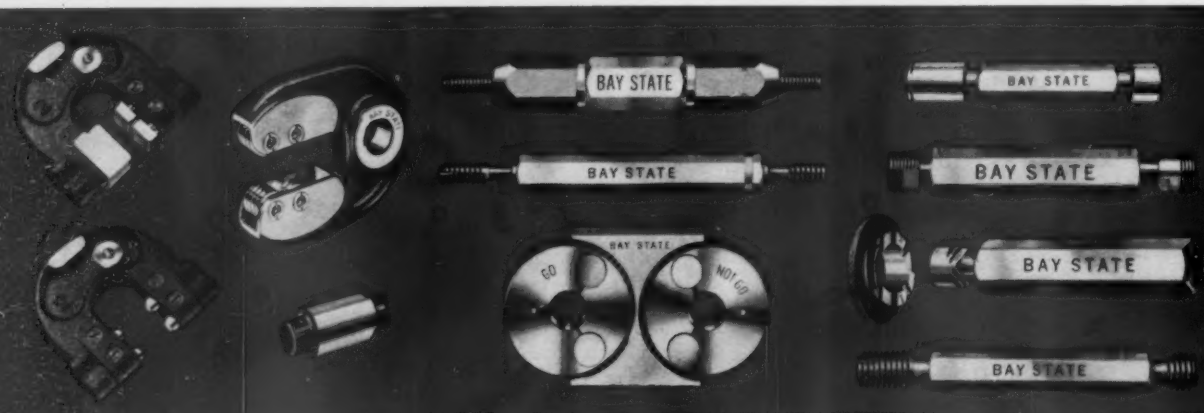

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CIRCLE 328 READER SERVICE CARD

WASHINGTON...

Tax lures deferred . . .

The tax incentive to encourage business purchases of machinery and equipment is on the shelf until next year.

As Congress got closer to an adjournment date, it became clear that a bill could not get through Congress this session. The Senate Finance Committee, for instance, had not even scheduled hearings.

At a meeting with the president and top Treasury officials, Democratic members of the House Ways and Means Committee laid out this situation, and the consensus was to keep the bill in the Committee until next year.

This decision spares House members the painful choice of voting for or against a tax cut for one group of taxpayers (business firms) and for or against tax increases for millions of other taxpayers (dividend receivers, co-ops, and the like).

The last glimmer of hope for the 8% tax credit as tentatively worked out in the Ways and Means Committee was extinguished when the ten Republican members of the Committee came out solidly against it, as it became increasingly clear that the tax package was in trouble.

The net of all this is to put the burden on Treasury Secretary Dillon to figure out a tax strategy for next year. He had earlier promised to report to Congress on the need for depreciation reform—although this doesn't necessarily mean recommending a liberalization across-the-board, as many have come to assume.

Strong administration support is an essential for most tax measures of this kind, if they're to get anywhere at all. In view of the huge amount of work put into this year's proposals with so little in the way of results, Dillon and Kennedy will be taking an entirely new look at what they want to propose to Congress in January.

Slowdown on exports to USSR . . .

Machinery and equipment exports to the Soviet Bloc will be subject to a massive slowdown by the Commerce Department officials responsible for issuing the licenses required for such trade.

It's part of the pulling and hauling over the Berlin situation. The amount of trade involved is small, although the totals have risen sharply in the last couple of years. Of course, only applications for items judged non-strategic have been approved. (All trade with Red China is embargoed.)

Most trade with the Soviet bloc has been with Poland, which benefits from a special policy ruling that favors greater trade, especially in food and other civilian goods.

However, there's been a wide variety of machinery and equipment approved for shipment to the Soviet bloc although in relatively small amounts. Among the approvals during the first half of the year: a gasoline blender, dry-cleaning equipment, percussion-type drills, industrial sewing machines, diamond bits and parts, paper pulp mill equipment, turbo-shearing machines, accounting machines and construction equipment.

Applications turned down include those for gear-hobbing machines, integral grinders, grinding spindles, and transfer machines.

The Soviet Bloc nations are still seeking technical know-how. Applications approved for shipment of technical data during the first half of this year related to such things as continuous annealing and pickling lines, a drawbench and hydraulic squeeze pointing machine, blast-cleaning equipment, and rotary flying hot saws.

Most of these applications were submitted for the purpose of negotiation; Commerce has no way of knowing how many come to fruition.

Machine tool minimum pay rates . . .

Public hearings will be held here September 6 by the Labor Department to determine minimum wage rates for machine tool plants which sell to the government. The action comes under the Walsh-Healey Act, which authorizes the Labor Department to set an official floor on production worker wages for government suppliers, based on prevailing minimum pay rates in the industry. Up to now, a Walsh-Healey rate has never been determined for machine tool builders.

A Labor Department wage survey in April 1960 showed a prevailing minimum wage average of $1.75, determined by numbers of plants rather than by individual workers. This figure will be the basis for discussion of the ultimate official rate to be determined. The survey covered 42,000 production workers in 287 plants having at least ten employees each. Government procurement of machine tools runs at an annual level of about $35-million.

Management and labor representatives will discuss the survey conclusion at the conference, and debate the type of minimum wage determination to be made.

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No, because Valvair knows that smoothness of surface is directly related to O-ring life . . . to multi-million cycle dependability of valve performance. That's why Valvair is the only manufacturer of O-ring sealed spool-type air control valves who won't settle for a bored finish, no matter how good, for surfaces in contact with main O-rings.

All Valvair Speed King® valve bores are honed to an extremely smooth surface finish of 20 micro-inches or better . . . stems are polished to 10 micro-inches. Each part is checked, prior to assembly, with a surface measuring instrument to be sure it meets Valvair's high standards of surface finish. This painstaking attention to product quality is your guarantee of Valvair performance and service life.

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DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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DETROIT...

Cars should boom . . .

New car time is outlook time in Detroit, and the auto people are predicting a healthy rise in production and sales for the coming year. It's traditional to be optimistic, and psychologically it's the only possible attitude to take; but the trends this year are all in favor of a good climb in car business.

Lee Iacocca, Ford VP and general manager of Ford Division, notes strong truck sales, unusually good model-year cleanup, and Ford Division sales that will come close to last year's total of 1.4-million units. He says a 6-million-car year is in the bag, which means the slump earlier this year only cost the industry 10% in car sales. It's rather a large "only", but the outlook is much improved over six months ago.

J F Wolfram, general manager at Oldsmobile, looks for an outstanding year in '62, possibly over the 7-million mark, which would be close under the record set in 1955. He hopes for Oldsmobile sales of 450,000 cars, an increase of 35% over this year, under highly "favorable circumstances". In direct defiance of the general trend this year, the Olds 98 is two inches longer than last year.

Engine comparison . . .

While new-vs-old comparisons don't always add much to the production art, Ford's announcement of its 221-cu-in. light cast-iron V8 was accompanied by a good display comparing the '32 L-head V8 with the new engine. For those who still say, "They don't build them the way they used to," here's a clear indication of why they don't and why you wouldn't like it if they did:

	1932	1962
Displacement, cu in.	221	221
Bore, in.	3.0625	3.50
Stroke, in.	3.75	2.87
Compression ratio	5.5:1	8.7:1
Max bhp at rpm	65 at 3400	145 at 4400
Torque, ft lb, at rpm	139 at 1500	216 at 2200
Engine weight, lb	530	465
Bhp/cu in.	0.294	0.656
Bhp/lb of weight	0.123	0.312
Main bearings	3	5

It adds up to a lot more power out of a smaller engine, using less gasoline (still regular grade fuel) and with less engine wear.

This is one step in Ford's avowed progress toward a car that needs only to be gassed, washed, and checked spring and fall. Other steps, of course, are longer oil-change periods, longer lubrication spans, and **two-year coolant.**

According to a survey quoted by Ford, the average consumer rates the family refrigerator at the top of the list of household hard goods in unobtrusive perfect function, and the family car at the bottom. The aim at Ford is to get the car up the list a few notches, perhaps at least even with the kitchen stove. The same aim is shared by GM's widespread reliability program and by Chrysler's new program along similar lines.

Pocketa-pocketa . . .

If you run a cab or a fleet, note Plymouth's recent announcement of the availability of their taxicab with a Perkins (British) four-cylinder diesel engine (203 cu in., 72 hp at 3000 rpm). Up to now these engines have been placed only in selected cab fleets in 20 U S cities. Though acceleration is limited and the engines have a peculiar characteristic "pocketa" sound, the diesel offers economy, easy maintenance, and marvelously long life—probably even in a civilian car, if you insisted.

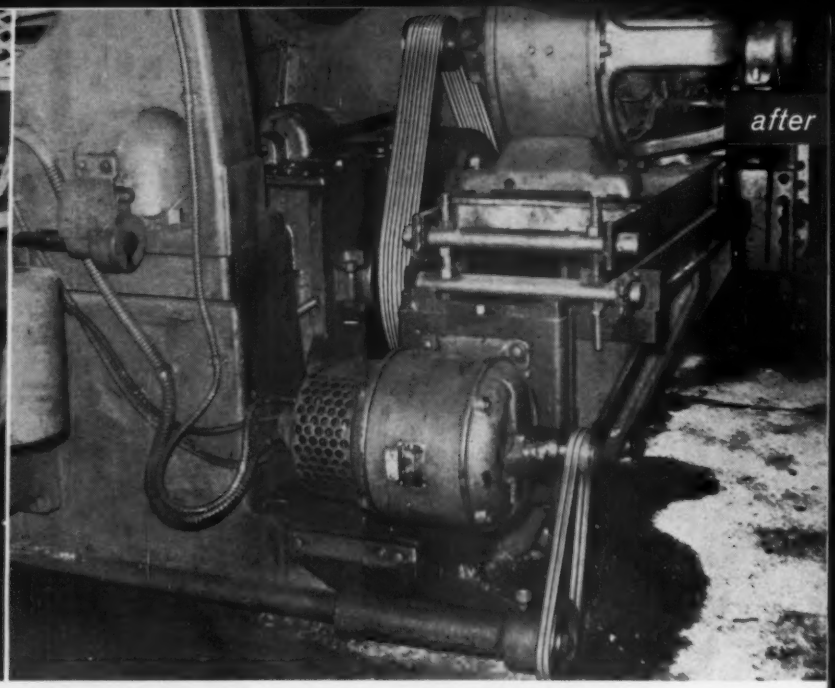
More on cast-iron engines . . .

How far can cast-iron engines go, even with mechanized core production, when the cores themselves still must be more or less hand assembled? This is the area, say die-casting proponents, where hand work cannot be entirely eliminated. This hand work is the area in which they claim great cost advantages for die-casting (in addition to savings in machining).

The next step for foundry casting is mechanized core assembly. Obviously difficult, but not necessarily impossible.

Ford casting progress (*AM/MM*—Aug 21 '61, p81) is based partly on precision cores, developed out of shell molding. In the new 221-cu-in. V8 engine, the camshaft, crankshaft and some other parts are shell molded with phenolic binders and sand. The block, heads, intake and outlet manifolds, and some housings are precision cored with urea-resin binders and sand. In a short time, conventional sand casting will be practically eliminated from the entire American auto industry

Precision molds and cores, plus high-temperature water-cooled melting furnaces, now produce iron castings with walls under 0.190 in. thick—in regular production (even thinner, experimentally) in both conventional gray iron and nodular (or spheroidal, or ductile) iron.



Gates

Industrial News

Gear drive caused chatter marks on parts

Gates Super HC High Capacity Drives replace gear and flat belt drives

GATES SUPER HC DRIVE REPLACES GEAR DRIVE IN LIMITED SPACE...

ends costly rejects

Chatter marks on parts produced by a vertical boring mill at Manitoba Bridge and Engineering Works, Ltd., in Winnipeg resulted in costly rejects. The cause of the chatter marks was traced to the gear and pinion on the main drive.

About a year ago, the plant engineer investigated the possibility of replacing the gear drive with a flat belt or conventional V-belt drive. However, to do the job, both types of drive had to be too large to fit into the limited space available.

Advised by a Gates Representative, he then designed a Gates Super HC High Capacity Drive for the boring mill. He found that the high capacity Gates Drive was so compact that it could readily transmit the required power in the space vacated by the gears. Now, with the smooth-running Gates Drive, the mill is turning out clean, even cuts, eliminating chatter marks.

The Gates Fieldman located near you is a drive design expert. To contact him for help in designing a new drive, or for quick delivery of replacement V-belts, call your nearby Gates Distributor.

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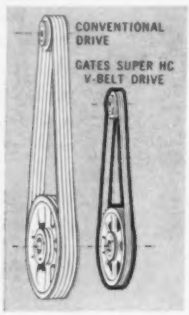
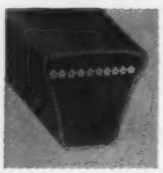
Designing a new Drive?

Gates High Capacity Drive saves space and money ... cuts bearing loads



When you design a new drive or replacement drive, you can save space, weight and money by using a Gates Super HC V-Belt Drive—the first and most advanced high capacity drive. Because of exclusive design features, this new Gates Drive can often transmit the required horsepower in about half the space needed by a conventional V-belt drive—with fewer belts and smaller sheaves.



Drive costs are reduced as much as 20%. Drive weight is reduced 20% and more. Guards and machine housings can be smaller, shafts shorter. Reduced weight and overhang on bearings cut bearing loads. Moreover, the Gates Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing!

Need replacement V-belts?

Why Gates Hi-Power V-Belts are industry's No. 1 choice today

The exclusive construction features of Gates Hi-Power V-Belts—Concave Sides, (U.S. Pat. 1813698) Precisely-Engineered Arched Top, Flex-Bonded Tensile Member—make them more dependable than ordinary conventional V-belts, giving you far longer belt life on even the toughest applications.

Moreover, because of Gates high standards of quality control, you get a perfectly matched set of Hi-Power V-Belts every time—every belt pulls its share of the load throughout the long service of the drive, further increasing belt life.

CIRCLE 330 READER SERVICE CARD

AIRCRAFT and MISSILES...

TRENDS

Extra money for bombers . . .

Final version of the Congressional defense appropriation earmarks $705 million for Air Force bomber production and development which the Kennedy administration does not want.

Congress voted $525 million to continue Boeing B-52 or Convair B-58 production (Present schedules for both aircraft call for phasing-out production next year.) and $180 million extra to accelerate development of North American Aviation's B-70 bomber. (The administration's current plan is to spend a total of only $220 million this year.)

Under the Congressional proposal, the additional B-70 funds would be used to reactivate development work on electronic sub-systems which were cancelled (for the second time) earlier this year.

But as the situation shapes up now, the Pentagon will not be allowed to use the extra bomber funds. Defense Secretary McNamara is reluctant to commit more money for manned Air Force bombers. The revelations of Soviet bomber advances at the recent Moscow Air Show have not swayed him from this position.

New communications satellite . . .

National Aeronautics & Space Administration will place a communications satellite into a 22,300-mile-high synchronous orbit around the earth late next year.

Hughes Aircraft Co has been awarded a $4-million contract to build three flight models of the satellite, which has been dubbed "Syncom." A three-stage Delta rocket vehicle will boost the satellite into orbit.

NASA's new satellite will relay telephone and data transmissions. The project is similar to the Army's project Advent designed to provide a military satellite-communications network using three or more synchronous satellites. NASA will use Army ground facilities for its initial experiments.

Curbing sole-source procurement . . .

The Pentagon has two specific actions under way to reverse the trend toward sole-source procurement, but Defense Secretary McNamara has warned Congress that it may take five years to realize dollar savings.

McNamara sees no chance of making inroads into sole-source procurement of major items, such as aircraft, in the near future.

His main device, which isn't expected to find favor in industry, is to require that drawings and specifications under any development contract be prepared according to a specific timetable, so that they can be turned over to competitors immediately when it is time to bid on procurement of the item.

The second step is to review all sole-source procurement procedures in a search for other ways to reverse this trend.

Missile site wages "unreasonable" . . .

The recently created Missile Sites Labor Commission has issued its first decision branding wage rates at a missile site construction project as "unreasonable."

Commission said that wage rates for construction of Atlas missile-launching sites naar Forbes Air Force Base, Topeka, Kansas, were as much as 13% higher than rate for similar work in the surrounding area.

Aerospace roundup . . .

- NASA plans to buy at least five, possibly ten, more Lockheed Agena B upper stages by early 1963. These will be in addition to the five now programmed. The vehicles will be used in tests of various Apollo systems.

- **Air Force and Douglas are attempting** a precise correlation of aircraft structural fatigue produced in flight with fatigue produced by test rigs. In-flight tests on a C-133 transport are being duplicated in a water test tank at Douglas' Long Beach (Calif) plant.

A note on Soviet rocket output . . .

With one eye obviously cocked on the Berlin crisis, the Soviet Union has told the world that just one of its plants produced 250 huge rockets in one year. With the secrecy that surrounds all Russian military work, the Soviet press normally doesn't even mention rocket factories.

Western observers believe the report is simply another step in the Soviet program to intimidate Western powers and their allies.

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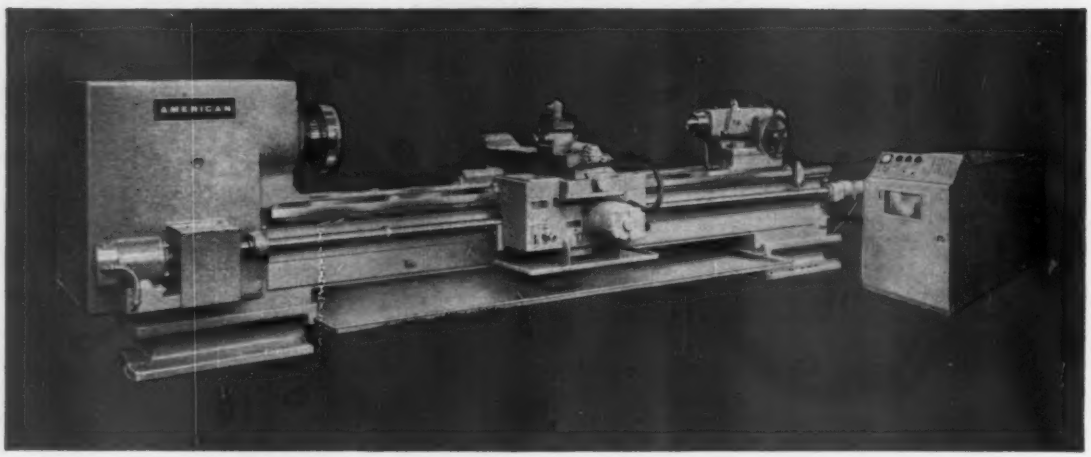

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CIRCLE 331 READER SERVICE CARD

MACHINE TOOLS...

Air Force buys more N/C tools . . .

Douglas Aircraft has placed orders for eleven new numerically controlled machine tools as part of the Air Force Industrial Modernization Program. The announcement of this order confirms an earlier report (*AM/MM*—June 26 '61, p57).

The eleven machines add up to over $3.3 million. The order includes five Giddings & Lewis 5-axis profilers two large G&L 3-axis DiMil profilers, two G&L 4-axis vertical turret lathes, and two 4-axis Sundstrand Omnimils.

In addition, Douglas is purchasing with its own funds four other N/C machines—one G&L 5-axis profiler, one G&L 3-axis DiMil, and two 4-axis Sundstrand Omnimils. Douglas is also retrofitting an existing G&L 5-axis profiler.

All of these machines are to be equipped with Bendix Dynapath solid-state control systems.

Replacement program approved . . .

The Army's machine tool replacement program for the current fiscal year has been approved. The Army will be allowed to buy close to $5 million worth of tools to replace worn-out capital equipment and to modernize arsenals.

This is about $800,000 under last year. These figures do not include sums for machine tool procurement to expand capacity or to set up new production lines.

High-precision machine readied . . .

An Eastern machine tool builder will soon deliver a high-production machine of unusual accuracy to drill and ream a cluster of holes in an automotive transmission part.

Holes must be within "tenths"—both for size and radial position. New lightweight transmissions in the new cars depend upon precision machining and alignment for durability and low noise level; this should result in considerable new machine tool orders.

Detroit will need new tools . . .

Aluminum die-castings, which are gaining ground rapidly in the auto industry, will, as just noted, have an impact upon capital expenditures.

New machining facilities will be required or, at least, present facilities must be rebuilt. The tonnage and total cost of such facilities, however, may be reduced from present levels.

Where aluminum replaces cast iron, less metal has to be removed in cutting operations, the machine tools can operate at higher cutting speeds, and tool loads can be reduced. In some cases, the die-casting process will permit parts to be redesigned.

For example, Chrysler's new 3-speed automatic-transmission housing also includes a clutch housing and part of the hydraulic valve plate that controls the transmission.

Although the housing now has more holes and surfaces to be machined, it is machined on a 200-ft-long transfer line that more or less replaces the former 1200-ft-long line at the Kokomo, Ind, plant.

Tool inventory for Australia?

An Australian government official, writing in *Australian Machinery and Production Engineering,* the official publication of the Institute of Machine Tool Makers (Australia) Inc, says, "There is need for more accurate and overall information of the machine tool population."

"A census of machines is needed," says R Cornell, Ministry of Supply, and points out that the task would not be too formidable. If the census were confined to the engineering trade (that is, excluding textile, steel-making, and food) it would involve some 6000 factories.

It is envisaged that machines would be categorized into about 150 types. The census would be designed to determine type, age, and origin of each machine.

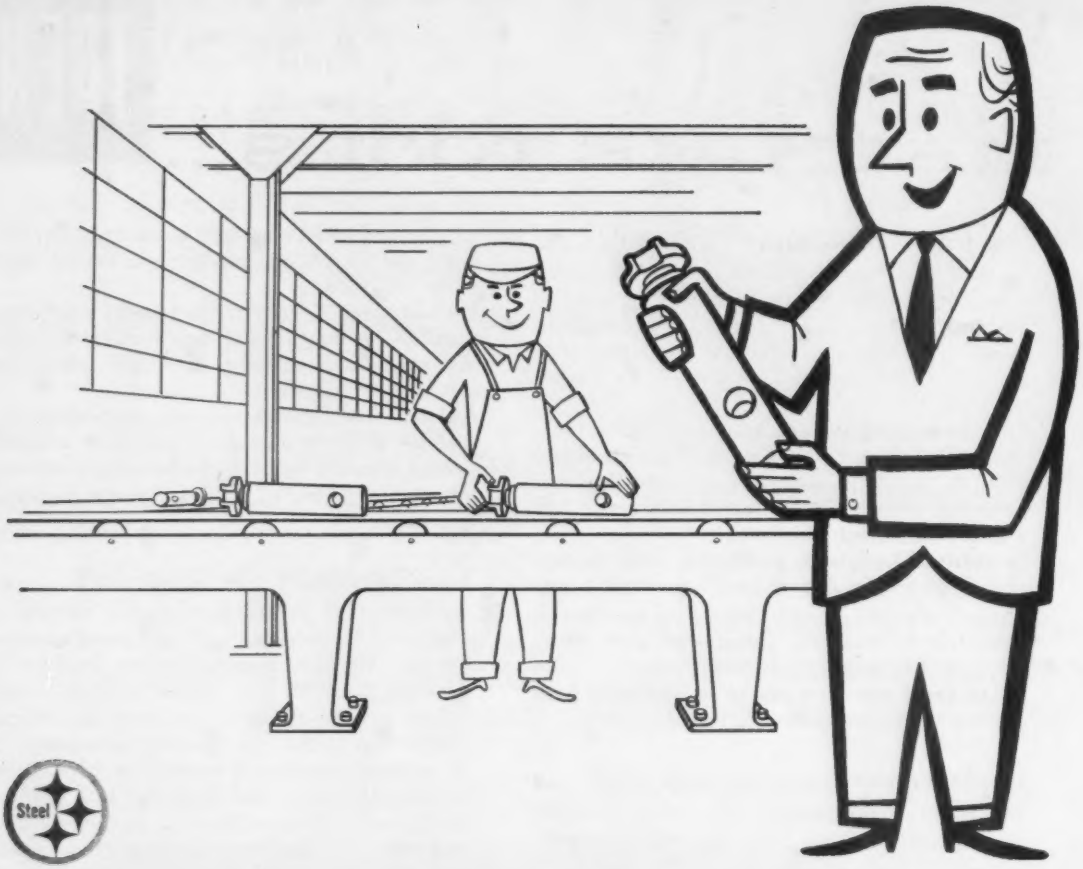
Like the AM/MM Inventory, this proposed Australian census would be repeated at intervals of some years, or possibly yearly.

"Buy Japanese" Act considered . . .

The Japanese Ministry of International Trade and Industry (MITI) is considering measures to protect the Japanese machinery industry from the impact of liberalized imports. The Japanese government recently decided to free 90% of imports by the end of September 1962.

Such protective measures might include:

- **A "Buy Japanese" Act** to oblige Japanese buyers to give priority to Japanese-made machines unless they are priced much higher than imported machines.
- **Revision** of the Machinery Industry Promotion Law to promote machinery exports.
- **Establishment of a semi-governmental** financial organization to enable heavy electrical machinery and large machine tool builders to sell their products on a deferred-payment basis (10 to 20 years) to customers in the domestic market. Foreign builders have done well in Japan by offering generous credit.



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MATERIALS...

Ultra-pure lithium . . .

Perfection of a high-output refining process by Foote Mineral Co, Philadelphia, has made 99.92% pure lithium available in commercial quantities. Ingots up to 125 pounds have been produced. Ingots weighing only two pounds, or less, as well as machined shapes, are available.

Major breakthroughs in the power, nuclear, chemical, rocket and spacecraft, fuel cell, and drug fields are forecast as a result of the new process, which is described only as "electrolytic." Lithium is an exceptionally good CO_2 absorber. It also is a very light metal.

Researchers see uses such as: CO_2 absorbers and oxygen generators in gas masks, spacecraft, submarines, mining air supplies, and air-raid shelters; opaque ceramics, shielding materials, nose-cone heat shields, air-conditioning systems, solders and brazing compounds, sintering lubricants, and many organometallic compounds.

Especially low in nitrogen content (only 15 parts per million), the high-purity lithium is less corrosive than the previously available metal. Potassium is down to 100 ppm and chlorine is held below 20 ppm. An earlier development reduced sodium to less than 40 ppm.

Reduction in its corrosive characteristic is expected to boost liquid lithium's use as a heat-transfer medium in nuclear reactors. Up to 1600 F, the lithium is readily contained in AISI Type 316 stainless tubing. Some users prefer to contain it in spun tungsten or spun columbium at temperatures over 2400 F.

A research chief at a large Philadelphia research center (not Foote) said he saw the new high-purity lithium development as "highly significant." But, he said, lithium companies' R&D staffs and facilities already are "taxed to the absolute limit" running down leads. It's a sign of the times that the "high-purity" lithium is 99.92% pure, while the conventional commercial grades available at this time are 99.88% pure—only 0.04% less pure.

Improved chromium alloys . . .

Rights for the development of an Australian system of improved chromium alloys for high-temperature applications have been acquired by Du Pont from the government of Australia. Under the agreement, Du Pont will have sole US rights to investigate the chromium alloying process and to manufacture the metal if feasible. Royalties will be paid to Australia if commercial production is undertaken.

Chromium is regarded as a promising base material for alloys to operate at temperatures higher than those practical with current special nickel-base alloys (but below the higher temperatures for which tungsten, tantalum, molybdenum, and columbium qualify). Its outstanding property is oxidation resistance.

The metal in the pure state becomes brittle and non-ductile under certain conditions of exposure. The Australian laboratories have overcome these deficiencies by alloying. Du Pont hopes to make the alloys commercially practical.

Stainless foil + adhesive . . .

Pressure-sensitive, adhesive-coated stainless foil, available in widths to 24 in., can be applied firmly and lastingly to any flat surface. Produced by the Fasson Products Division of Avery Adhesive Products, Inc, Painsville, Ohio, the foil is already working well in architectural, decorative, and kick panels; metal furniture; identification plates and signs.

At a low price, it offers rugged, corrosion resistant, yet decorative, protection.

Stainless foil is never as readily worked as the popular thin aluminum foil which can be manually shaped to any surface. Even the thinnest stainless foil normally requires a ball peen hammer, a rubber mallet, or some other shaping device. It's tough and it fights back.

However, in many cases, the stainless foil can be applied in the flat and formed with the object it covers. The Fasson product (and most stainless foil) is made in 300 series, 18-8 stainless steel. Most stainless foil specs call for thicknesses ranging from 0.001 to 0.003 in., but heat insulating foils may run to 0.010 in. or thicker.

Surface composition different . . .

Discovery of a striking difference between the composition of the surface of a dilute metallic alloy and the composition of the bulk of the material beneath the surface undoubtedly will affect future technology in catalysis, adhesion, and corrosion. Research described by Joseph T Kummer of Ford shows that the surface of a dilute copper-nickel alloy 99% Cu—1% Ni is composed of 90% copper and 10% nickel—ten times as much nickel as the bulk of the metal. It has been assumed that surface composition was the same as that of the material beneath.

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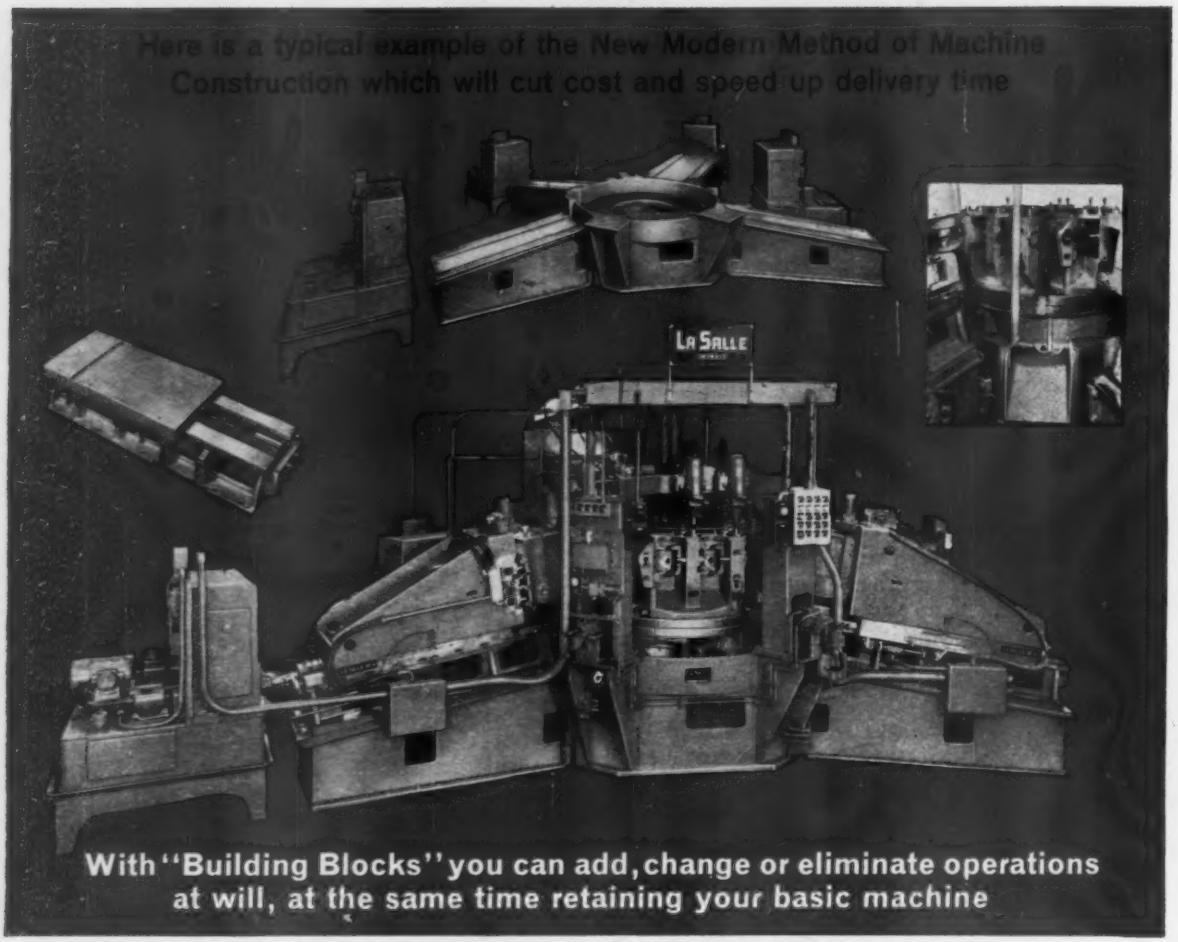
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WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking production reaches 18-month high . . .

Metalworking production, as measured by the AM/MM Index of Metalworking Production, has reached 109 (based on 1957=100), the highest level since January 1960, when the index also hit 109. This figure also represents the highest peacetime index. Only in 1943 did the index exceed 109, and even then the peak was 114.

So, despite scattered complaints of slow business, the industry has moved into high gear.

Steel producers report that ordering is on the way up, but that automotive ordering continues to mark time. Detroit is waiting to see the outcome of the current bargaining talks. Fourth quarter activity is expected to be the best since the second quarter of 1960, says one major steelmaker.

Sheetmetal shops are having a good third quarter, with excellent prospects for the fourth and for the year as a whole. Forecasts are for a 5-10% gain for the rest of the year over the comparable period of 1960, with a similar gain for the whole year.

Orders for industrial materials handling equipment showed a 39 point gain on the monthly bookings index of the Material Handling Institute. Index now stands at 175.51 (based on 1950=100). The bulk of the upswing is accounted for by orders for highly engineered systems rather than for standard or modified equipment.

Plastic molding shops report good business. One shop is said to be overflowing with unfilled orders. The business is coming primarily from the electronics field. Shops dealing heavily with the appliance and automotive fields also report good business.

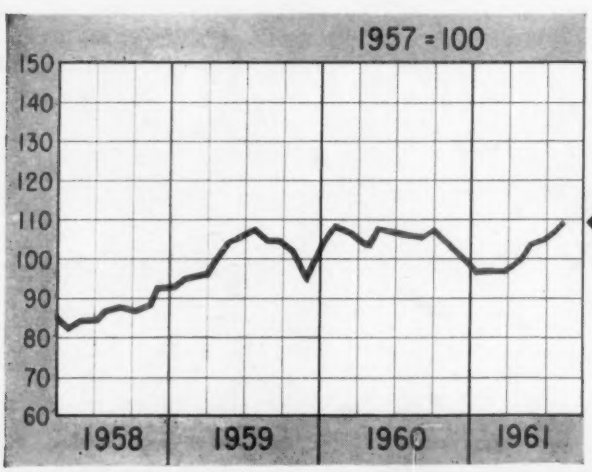
Bearing manufacturers, on the other hand, have run into an unusually slow third quarter. Several companies feel that 1961 will not measure up to 1960; others anticipate a pickup in the fourth quarter (based on the President's call for a buildup in conventional arms) that will carry 1961 sales slightly above 1960 levels.

Gray iron foundry operations tapered off in the latest month. Operations were at 55% of ideal capacity, compared to 67% in the prior month.

Welding shop business has picked up a bit in recent weeks but the situation is still spotty. Ordering is mostly hand-to-mouth. The peaks and valleys should balance out during the remainder of the year and bring 1961 up to about the same business level as 1960.

Drop forgers are still feeling the effects of the summer slowdown, but they expect things to perk up early in the fourth quarter. Some forgers expect business to be down as much as 10% from last year. A good pickup in the next quarter could narrow that gap quite easily.

Railroad car manufacturers are in a badly depressed state despite the pickup apparent in other areas of the economy. There has been no improvement in the third quarter after a bleak first half. Railroads aren't about to invest in capital equipment without a substantial boost in carloadings, and this doesn't seem too likely to happen right now.

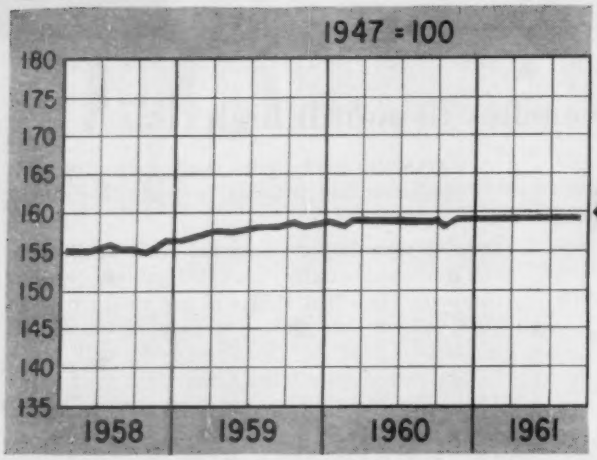


AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG Estimated	JUL Preliminary	JUN Revised	JUL Year Ago
Total Index	**109**	**108**	**105**	**106**
Machinery	**104**	**101**	**107**	
Electrical Machinery	**120**	**116**	**114**	
Autos	**113**	**113**	**113**	
Other Transportation	**92**	**88**	**90**	
Other Metalworking	**112**	**109**	**112**	

TRENDS WHAT'S AHEAD... in Business



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	AUG Estimated	JUL Preliminary	JUN Revised	JUL Year Ago
Total Index	**159.7**	**159.6**	**159.5**	**159.4**
Metalworking Machinery	**194.0**	**193.8**	**192.4**	
Other Machinery exc. Electrical	**174.2**	**174.0**	**172.6**	
Electrical Machinery	**158.4**	**158.5**	**159.6**	
Fabricated Metal Products	**147.1**	**147.1**	**147.6**	

Record factory sales expected this quarter . . .

According to a recent survey by the Department of Commerce, manufacturers expect their sales to rise 4% in the third quarter. Replies to the Department's questionnaires indicate that factory sales may rise to a rate of more than $95 billion dollars in the third quarter from $91.8 billion dollars in the second. This would be an all time high for factory sales, topping the previous record high of $93.5 billion in the first quarter of 1960 by a substantial margin.

In addition, manufacturers indicated they would increase their inventories during this quarter, thus adding a significant extra push to overall business activity. The inventory increase is expected to total $1 billion at an annual rate which would put factory stocks at the end of September at $54.4 billion. Durable goods manufacturers are expected to account for about two-thirds of the increase and soft goods manufacturers for the remaining third.

An addition to factory inventories in this quarter would be a sharp turnaround from the long paring period during the recession. The last measurable increase in factory stocks occurred in the summer of 1960. After declining about $400 million in the first three months of this year, factory stocks held at $53.4 billion during the second quarter.

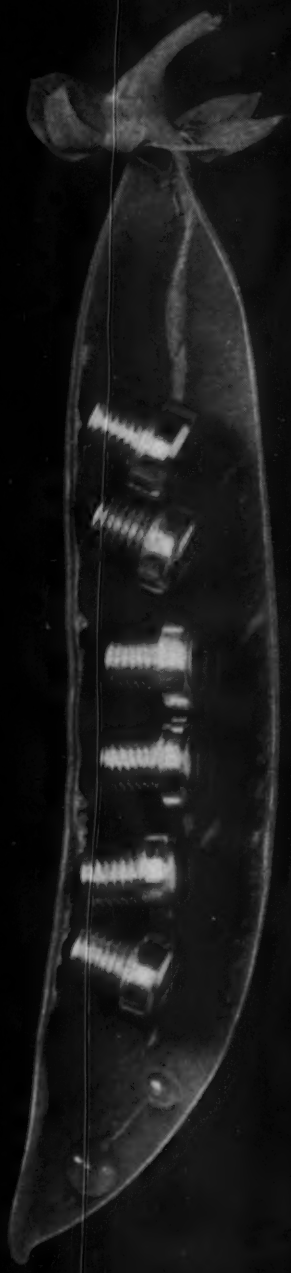
The current survey on manufacturer's expectations about sales and inventories is the first public release of a procedure that has been going on since 1957. In the interval between 1957 and the present, when no public releases of the survey results were made, the Department of Commerce tested the surveys and perfected the statistical techniques involved. The purpose of the survey is to give economists and business analysts an advance notion of the probable trend of inventory fluctuations. Even if manufacturers' expectations are only partly realized in this quarter total economic activity will receive a real lift.

WEEKLY BUSINESS INDICATORS	*Latest Week*	*Preceding Week*	*Year Ago*
Business Week Index of Activity (1947–1949=100)*	153.1	154.3	146.1
Steel ingot operation (thousands of tons)	1,944	1,910	1,558
Electric power output (million Kilowatt hours)	15,665	16,080	14,866
Production of automobiles	13,766	12,029	47,437
Engineering construction awards (*Eng. News-Record*—thousands)	75,745	78,921	77,451

MONTHLY BUSINESS INDICATORS	*Latest Month*	*Preceding Month*	*Year Ago*
Index of industrial production (1957=100)*	112	110	110
Index of durable manufactures production (1957=100)*	108	105	106
Durable goods manufacturers' sales, billions	14.72	14.58	14.88
Machinery manufacturers' sales, billions	4.85	4.82	4.74
Durable goods manufacturers' new orders, billions	14.85	14.80	14.34
Machinery manufacturers' new orders, billions	4.76	4.78	4.69
New Orders for nonelectrical machinery (1950=100)*	179	176	176
New Contracts for industrial construction (1950=100)	111	127	154

*Seasonally adjusted

CIRCLE 334 READER SERVICE CARD ►



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American Machinist / Metalworking Manufacturing ESTABLISHED 1877

Letter From England

LONDON—I remember well my first night in London in 1944 when my room at the Park Lane had heavy paper pasted over the windows because the glass had been blown out by a fly-bomb.

I recall the nightly alerts and the V-2s that brought disaster without warning. I still shudder when I think of having been driven back to my hotel in pitch-blackness during what the British called a dimout.

There was the aircraft plant in the Midlands with identical production lines at both ends of the building as a hedge against a knockout of operations by bombing. Those were bleak days and nights for the British.

Seven years after the war . . .

in 1952, London's appearance had not changed much. The over-all effect was drab and huge bombed-out areas were all around. Food was not plentiful and was of poor quality. One friend brought back from Germany, of all places, a pound of butter—a real luxury. Few cars were on the roads outside the big cities.

London store windows displayed lots of merchandise for export. The British people had the privilege of looking at it, but not buying it. It was to go overseas to acquire funds needed for importation of essential goods.

But by 1956 a transformation had begun. Bombed sites were being cleaned up, new buildings erected, and London was taking on the cheerful atmosphere of a newly-painted establishment.

As I visited England during each of the next four years, I saw an industrial revolution at work. The roads were filled with cars. Britishers, by means of "hire-purchase" (installment buying), were purchasing "fridges" and "tellies" for their homes. They had, and could afford, all the food they wished. Prosperity had taken hold. The United Kingdom was thriving on an economy closely geared to the fortunes of the rapidly expanding automobile industry. Jobs were plentiful and men scarce. Never had the British lived so well.

But prosperity has brought . . .

critical problems. Wage rates and fringe benefits have shot costs up fast. There have been expensive work stoppages. Productivity has not risen proportionately and the national economy has not expanded as rapidly as that of neighboring nations. Prices have gone up so much that British goods have been at a severe disadvantage in world markets.

The British people, in the enjoyable practice of living it up, have been importing far more than they have been exporting. This financial imbalance finally endangered stability of the pound sterling to the point that the Macmillan government has recently instituted drastic and distasteful austerity measures to try to put the British financial house in order.

Concurrently with this shock-effect treatment, Britain is throwing its traditional trade policy to the wind in a determined bid to join the Common Market.

Once again the British . . .

by taking these momentous actions are showing political courage of the highest order. The national interest comes first, even at the risk of great unpopularity with the people. Instead of inviting further inflation, the government has moved quickly to try to halt it.

Perhaps there is a lesson in this for us.

Burnham Finney EDITOR

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The old Aro 7025 Vertical Sander was industry's favorite for years. Nothing could touch it for speed, power, reliability.

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VOL 105, NO 18 **American Machinist** / *Metalworking Manufacturing* SEPTEMBER 4, 1961

Research comes up with a new answer

What causes HARD SPOTS in steel?

The next time hard spots develop during work with high-strength steels, blame the machining techniques — not the steel itself. Here, research shows what these hard spots are, what causes them, and how they can be avoided

By James H Adams
and Donald D Goehler,
The Boeing Co, Seattle

Poor machining techniques overheated this high-strength steel (here magnified 250 times), causing layer of "untempered" martensite filled with cracks to form. Because layer is harder than HSS tool that will do next operation, machining is impossible

"The metal crystallized". . . . "I hit a hard spot". . . . "The steel is work hardening."

The harder the steel, the more frequently one hears these complaints from machine operators. They emphasize one of the aircraft industry's greatest problems: How to machine —reliably—the high strength steels that go into jet aircraft.

In yesterday's planes, designers specified low-strength materials because operating stresses were very low. Here metal failure seldom was the result of faulty machining. But today's jet operate at such high stress levels that control over machining of high-strength steels is essential.

What is behind these complaints? Low-alloy, high-strength steels of the AISI 4xxx Series do not work harden; if anything, they tend to soften under the impact of energy. And the possibility of "hard spots" in the stock is quite remote. Clearly, there is another answer.

To find out, we carefully analyzed a series of holes (drilled in AISI 4330 steel, heat treated to 220-240,000 psi) that had failed during machining. In the fracture analysis of these specimens, the microstructures gave a clue to the answer:

What appeared in all cases was a layer of transformed material along the edges of the holes. And in each layer there was a series of cracks.

Further work, confirmed by X-ray diffraction, showed that this layer was pure martensite, too hard for HSS tools to machine. To distinguish this phase from the martensite of the matrix (which is always tempered), we named this transformation product "untempered" martensite.

The steels in which this problem impaired part life were those heat treated to strengths above 200,000 psi. In particular, they were the alloys that designers specify for modern aircraft: AISI 4330, 4340, and 300M (modified AISI 4340).

Heat forms martensite

What caused the transformation along the hole edges? The first step to an answer was to find how the transformation could occur.

There are only two ways to form untempered martensite in a steel. First, it can be created by heating the steel to above 1350 F, transforming the steel to austenite, then quenching to a low-enough temperature to form martensite. Secondly, martensite can be created by working the metastable austenite that is retained in a martensite matrix.

The steels under study were all air-hardenable martensites. If they were heat treated in a solution, then quenched, the resulting martensitic structure would contain only about 1% of retained austenite at room temperature. This small percentage of unstable material could not be responsible for the amount of untempered martensite found adjacent to the holes. The distribution pattern of the new phase, as well as the presence of tempered structure behind the transformed layers, was conclusive evidence that the problem was caused by the *formation of heat in the machining process.*

Source of heat

One nagging question continually confronted us: "What is the source and intensity of the heat formed in machining?" We knew that when the temperature of the steel exceeds 1350 F, the transformation to austenite begins and is completed above 1500 F. It only remained to demonstrate that the machining operation

could induce temperatures this high.

A tool-to-workpiece thermocouple, adapted to a drilling machine, was set up to measure temperatures during drilling of AISI 4330M steel. During this test, temperatures close to 1400 F were recorded. And a theoretical calculation (considering the drill body to be at 100 F) indicated that temperatures exceeding 2000 F are possible at the cutting edge.

We could now make these assumptions: During some drilling operations, high temperatures can develop, transforming metal around the hole to austenite. When the operation is interrupted, the mass that surrounds the drilled hole quenches the heated zone so drastically that extremely hard martensite (Rh 68C) is formed. This rapid quench causes the volume to change and the hole to contract; as a result, the untempered martensite develops cracks that contribute directly to metal failure. And because HSS tools have a maximum hardness of Rh 64C, it becomes impossible to drill through the layer of untempered martensite.

Now we had the answer to the complaints of hard spots in the steel: *The spots were not present in the parts before machining, but were created in the drilling operation. Abnormally high temperatures were brought about by touching the steel at too high a speed, with too dull a drill.*

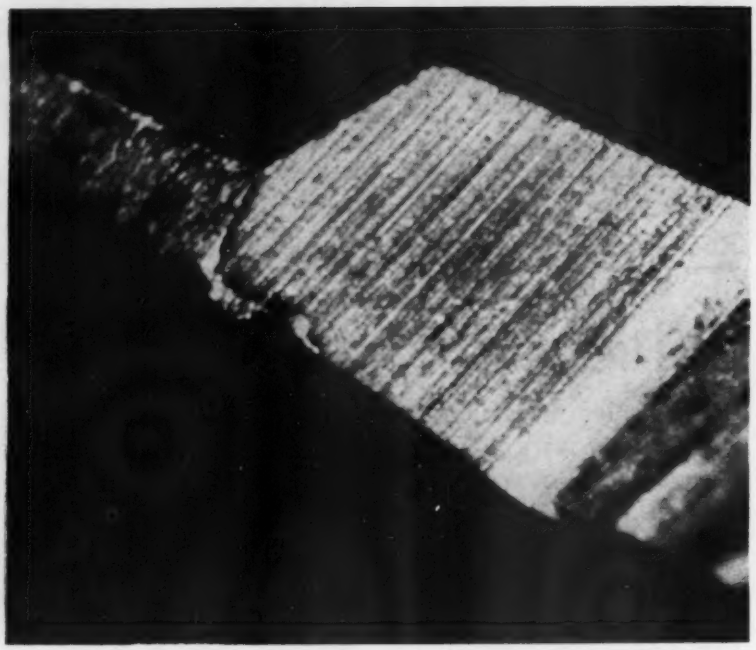
Testing the conclusions

An inspection of the machines involved confirmed our suspicions. Machinists did not worry about how they drilled a hole, so long as it met the tolerance requirements. As expected, there were frequent complaints about hard spots during machining operations.

At the next complaint of a hard spot, we removed the problem hole from the part with a trepanning tool. (A cross-section of the plug, showing the hard spot, appears in the microphotograph, right.) Here is the three-layer structure that is common to severe formations of untempered martensite.

Here, the white layer is untempered martensite with a hardness of Rh 68C. The gray layer is tempered martensite with a hardness ranging from Rh 53-56C. Between the tempered layer and the matrix, there is a band of precipitated carbides with a hardness of Rh 35C.

The hardness of the tempered (gray) layer varies from Rh 53C next to the white layer to Rh 56C as the matrix is approached. This variation, coupled with the softness of the carbide band, gives a clue to what happens during machining.



This reamer tooth has a large pit (left center) in it, created when it first touched a layer of untempered martensite that was harder than the tool. In its present condition, this tool is no longer satisfactory for work on high-strength steels

First, martensite forms in the problem area, up to the soft carbide band. There is a temperature differential from the edge of the hole inward, and only those areas hot enough to form austenite can be quenched to form untempered martensite. As soon as the temperature drops below that needed to bring about the transformation, the existing structure is further tempered, softening the area next to the newly formed layer and precipitating carbides.

Other operations in the area again heat it above the critical temperature. This heating (which again shows a temperature gradient) transforms the white layer to untempered martensite and tempers the remaining region of newly formed martensite. As the heat diminishes with distance into the region, different tempers are obtained in the steel. Because the point closest to the heat source is tempered at the highest temperature, it will be the softest; that farthest from the heat source will be the hardest.

Emphasis on tool wear

Clearly, something had to be done about the shop's attitude toward tool wear. The general feeling among machinists was that, as long as a tool was cutting, it was satisfactory (no matter how badly worn).

An examination of reamers in use proved the fallacy of this attitude. Above appears a tooth of one reamer that we examined. On the tooth there is a large pit created when the tooth first touched a hole in which untempered martensite had been formed during a previous operation. Tools in this condition (or those that have not been properly ground) create problem holes, regardless of the feeds and speeds used.

To correct this sort of practice, we recommended that strict regulations be placed on the number of holes that are produced with a tool before resharpening.

Effect on fatigue life

To determine what effect the layer of untempered martensite has on various properties of a part, we initiated several programs. First of these was a study of the fatigue life of material.

In this first program, a double-shear-type specimen was tested in tension-tension, with a load factor of $r = 0.06$, at various stress levels. Results showed that untempered martensite, regardless of the amount present, reduces the fatigue life by a factor of 20 at low stresses.

It should be emphasized that the amount of untempered martinsite present is not critical; so long as any

Cross section of "hard-spot" reveals three layers of varying hardness between edge of drilled hole and the metal matrix. See text for explanation of how these layers are formed

is present, there is a reduction in the cycles needed for failure.

Reworking problem holes

To find out whether holes that contain untempered martensite can be reworked, we made several tests.

The first, most logical test was to retemper parts in which untempered martensite had been formed. But this test was not successful, because the retempering operation does not eliminate the cracks in the layer. Retempering or "stress relieving" operations definitely cannot correct poor machining techniques.

Next we bored, broached, hand-reamed, and honed holes containing untempered martensite. Of all these processes, honing was the only one that raised fatigue life into the clean band of the fatigue curves.

On six speciments, in which 0.004 in. were removed from each hole diameter, three of the specimens were still dirty, that is, contained a layer of untempered martensite. Subsequent tests showed that at least 0.006 in. on the diameter had to be removed by honing to rectify any previous errors from reaming.

When boring of problem holes precedes honing, 0.010 in. on the diameter must be removed to eliminate all traces of untempered martensite and cracks. Thus, unless the initial machining is proper, honing is the only method presently available that will correct poor machining.

Stress-corrosion tests

We also studied the effect of stress corrosion on parts that contain untempered martensite. In several small panels of 4330M steel (220-240,000 psi) we drilled ½-in.-dia holes—one hole to a panel.

In some panels, we drilled holes under conditions that produce untempered martensite; in others, satisfactory holes were machined. Then we placed all panels in a bending moment, under stresses equal to 40% and 70% of the yield strength.

The results of these tests were astonishing. Subjected only to moist atmosphere, most holes that contained severe layers of untempered martensite failed within 200 hours. But several panels with clean holes have not failed at this writing (seven months later).

After three months in test, two problem holes still had not failed. Removing these panels and sectioning the holes, we discovered that, although untempered martensite was present, it was located in areas of compressive stress. Too, there were very few cracks in these holes. This test leads us to believe that it is probably the cracks present (rather than the untempered martensite) that cause stress-corrosion failures.

Research recommendations

To set up machining guides and recommend the best techniques, our Manufacturing Development Unit conducted an extensive program that considered all combinations of cutting-tool geometry, speeds, cutter life, and lubricants. From this program, back by our earlier research, came recommendations about future handling of high-strength steels:

• **Inspection:** Two methods of nondestructive testing were evaluated: eddy-current studies and surface-temper etching. The latter technique proved fruitless in hole tests. Under certain conditions, eddy-current equipment can detect the difference between defective and clean holes.

The eddy-current tester can also screen fatigue-test parts with 100% accuracy, but in production parts is unable (due to hole tolerances) to give consistently interpretable data. Further testing in this technique is in progress.

• **Process control:** Our studies showed that the only immediately feasible way to assure saisfactory parts was to institute process controls in machining operations.

These controls require that properly prepared tools be used, and only for a limited time under controlled conditions. As a periodic measure of the controls' quality, we recommended the fatigue testing program.

• **Design:** One prime objective of the research program was to find if there are economical ways to design parts so that problem holes can be avoided. As noted before, honing is the only way to remove untempered martensite and cracks completely. But in aircraft work certain assemblies cannot be manufactured economically when the final operation is honing. A typical example: joints in large structures of aluminum and steel.

Here are two design recommendations that came from our research:

(1) Where holes or surfaces in high-strength steel parts cannot be honed or shot-peened and are critical in fatigue, the lower endurance limit of steel that might contain untempered martensite should be specified.

(2) Because the first and last holes, in a line of holes, are the critical ones in fatigue, the width and thickness of splice joints should be increased, thereby lowering the unit stress. The increase in weight of the joint would be minimal, and the possibility of untempered martensite would be no greater.

Though we can design around most of the problem, there will still be areas that, because of fit-up and compound stresses, will exceed critical limits. Thus our machine shops must recognize the problems and exercise the greatest care in handling high-strength steels. These shops can no longer create reliable parts by working with the most inexpensive techniques. As the demands for better performance from materials increase, higher-strength steels must be specified; as a result, process controls must be tighter than ever. •

Stretching action forms compound contours

Androforming: a progress report

The Androform machine can form the same type of part that is normally produced on a stretch press (aircraft panels, refrigerator doors, auto roof tops), but can do it cheaper and better—and with fewer tools and facilities. So says General Dynamics/Fort Worth after about nine months of experimenting with this unique machine.

What is Androforming? Basically, the Androform forms sheet metal into a variety of compound contoured shapes by pulling the metal between a set of dies, the contours of which can be adjusted to provide the desired curvature.

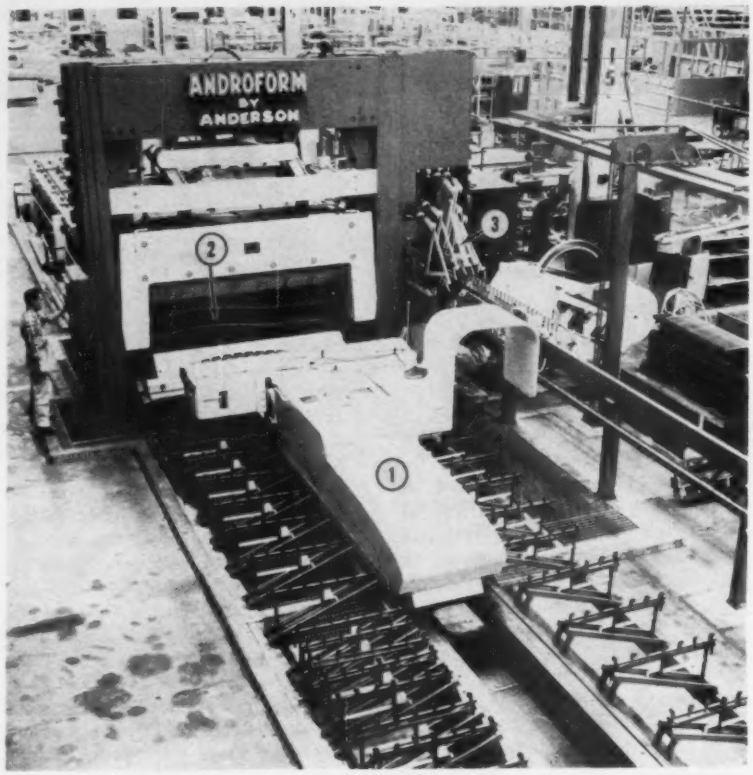
Androforming is very similar to curling of ribbon, paper, or aluminum foil by pulling it between your thumb and finger. The foil takes on a compound contoured shape because it is stretched more at the center than at the edges. It curls because the bending sets up tensile and compressive stresses on the surface.

The Androform machine creates the same condition in metal blanks. In operation, the material to be formed is placed on the feed table (upper left corner of photo), then pushed through the opened forming dies (2) until enough material sticks out the front of the machine so that it can be gripped by a set of knurled jaws. As the jaw carriage (1) starts to move, pulling the material between the dies, the dies close down upon the material.

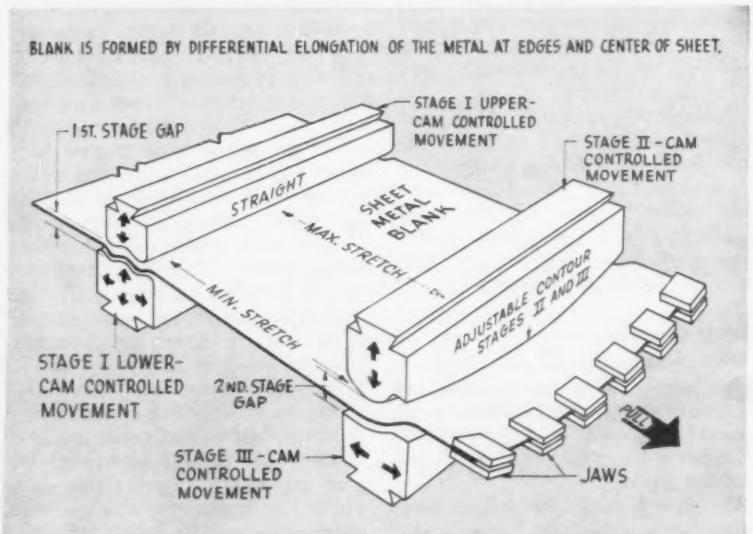
Four forming elements

There are four, polished tool-steel forming elements. (See sketch.) Two of these are straight and have matching beads that prevent the metal from slipping between them as it is being stretched; these are called Stage I. Stages II and III are flexible metal bars that can be adjusted to matching contours and locked in that position with screw-jacks. Stage II produces transverse curvature; Stage III prevents the metal from buckling and controls the degree of lengthwise curl.

Symmetrical contours are formed with the elements in a fixed position during the cycle. If varying contours are necessary, position of the elements must be changed while the material is passing over them. This is done hydraulically and is con-



Androform machine can produce compound-contoured parts from blanks as large as 8 ft wide x 36 ft long. Jaw carriage (1) pulls metal blank through adjustable-contour forming dies (2). Cams (3) can be preset to produce non-symmetrical contours


BLANK IS FORMED BY DIFFERENTIAL ELONGATION OF THE METAL AT EDGES AND CENTER OF SHEET.
1ST. STAGE GAP
STAGE I UPPER-CAM CONTROLLED MOVEMENT
STAGE II - CAM CONTROLLED MOVEMENT
STRAIGHT
SHEET METAL BLANK
MAX. STRETCH
MIN. STRETCH
ADJUSTABLE CONTOUR STAGES II AND III
STAGE I LOWER-CAM CONTROLLED MOVEMENT
2ND. STAGE GAP
STAGE III - CAM CONTROLLED MOVEMENT
PULL
JAWS

Androform has four forming elements, two straight, two adjustable to varying contours. All four elements are stationary when symmetrical contours are formed. Cam tracer feedback system move elements during cycle to form non-symmetrical contours

trolled by a cam tracer feedback system.

Setup time for the Androform runs 2½ to 3 times that of a stretch press for the same part. Three steps are necessary: 1) Stage II and III elements must be adjusted to a mean cross-sectional contour of the part; 2) the forming elements must be positioned in relation to each other to obtain the proper longitudinal contour; and, 3) the cams must be programmed to produce the desired contour variations.

Initial setup for each part, mostly by trial and error, averages about 12 hours. Subsequent setups can be reduced to about six hours if cam settings are recorded and templets are made of the element contours.

Size and shape of parts

The maximum size blank that can be formed on the model J Androform is 8 feet wide by 36 feet long. Maximum gage depends upon the material: up to 9/16 in. full-hard aluminum, up to ⅜ in. mild steel.

The Androform is limited to forming parts with gentle faired contours. It can produce a concave compound contour, a convex compound contour, a combination concave-convex compound contour, or an angular cut or tapered gage to any of these contours.

The limit on the contour attainable is the relationship of the width of the part to the radius of the transverse curve. Generally speaking, the radius cannot be less than six times the width. A part 50 in. wide could have a curvature of 300 in. radius. This rule applies only to relatively flat parts. As lengthwise curl increases, the degree of transverse curvature attainable decreases.

General Dynamics/Fort Worth is primarily interested in forming aircraft skins, but the Androform could also make contoured refrigerator doors, boat hulls, automobile roof tops and lower door panels.

Production parts formed so far at GD/Fort Worth include nacelle skins and fuselage skins for the B-58 bomber. Eighty stainless-steel nacelle skins (0.010 x 24 x 48 in.) were formed in 3.7 hours. Only seven operations, instead of twelve, were needed to complete the part. There were no rejects and no scrap.

In 2½ hours the Androform turned out 32 aluminum (2024-T86) fuselage skins (0.032 x 48 x 96 in.). This eliminated the use of special width stock, excessive hand forming, heat treating and aging.

Forms hardened materials

One outstanding feature of the Androform process is its ability to form sheet stock in the hardened condition. Normal stretch-forming procedure is to buy the material in the annealed or soft state and then preform, heat treat, finish-form, and age.

Chance Vought asked that the Androform be used to form high-strength materials, in thicknesses of 0.020, 0.040, and 0.060 in., to deep radiuses. The materials included Inconel X (180,000-psi ultimate tensile strength), 17-7PH 1050-TH stainless (200,000 psi), HM 21 XA-T8 Mag-Thorium (42,000 psi), Vascojet 1000 tempered (268,000 psi) and USS 12 MOV tempered (242,000 psi).

All these materials were formed to at least a 150-in. spherical radius without fracture.

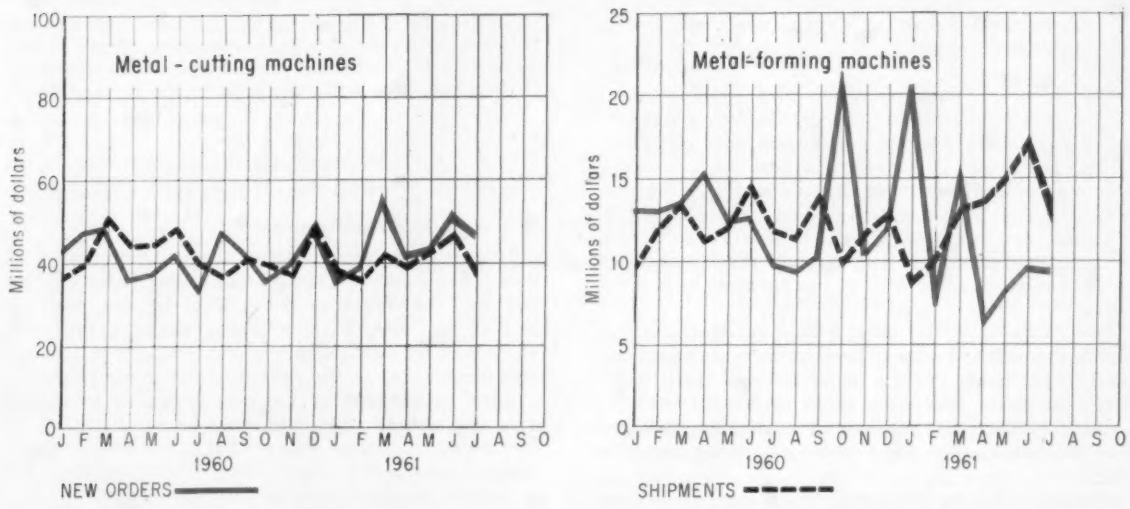
Material and tooling savings

The Androforming process requires no excess material on the width, and a maximum of 12 in. on the length of the blank. (Stretch press blanks need about 12 in. on each side and 20 in. on the length.) And because the tensile load is less there are fewer fractured blanks. It is reported that blanks can be re-formed as many as ten times without fracture. Scrap should be less than 2%.

Tooling is less expensive because one set of Androforming forming elements will produce an infinite number of contours. This eliminates individual stretch forms for each part. If you already have stretch-press tooling, however, it will take long production runs on the Androform to offset its higher setup time.

To date GD/Fort Worth has been able to turn out about 25 parts (not maximum size) per hour, but it expects to boost this to 30 to 35 per hour. It is estimated that runs of at least 35 parts will be needed to reach the break-even point. •

NMTBA Index of machine tool new orders and shipments



Net new orders for metal-cutting machine tools dropped off in July, according to preliminary figures from the National Machine Tool Builders Association, to $46,750,000 from a June level of $52,100,000. Shipments also declined, dropping from $46,750,000 in June to $38,400,000 in July. Orders for metal-forming machine tools eased to $9,200,000 in July from June's $9,400,000. Shipments in July dropped to $12,700,000

5/17/61 MO./DAY/YR.	CLOCK NO. 420	JOB NO.	OPERATION NO.	STRAIGHT TIME HOURS	OVERTIME HOURS	NAME: John Jones APPROVAL: EFK			
						NO. OF ACCEPTABLE PIECES	STANDARD PIECES PER HOUR	NO. OF PIECES SCRAP'D	WHY SCRAPPED? MORE SPACE OTHER SIDE
ALL OTHER	BREAKS, PERSONAL & CLEAN-UP	31501		.5	.				
				.	.				
				.	.				
SET UP & PRODUCTION	SET UP	3240	121—1	.2	.				
	RUN	3240	121—2	4.8	.	800	150	—	
	SET UP	3616	188—1	.6	.				
	RUN	3616	188—2	1.9	.	18	8	1	Dropped
	SET UP		—1	.	.				
	RUN		—2	.	.				
		Hours Worked:		8.0+	. =		TOTAL HOURS		

Labor performance report is filled out daily by each employee in the shop. At end of month, all cards go to a nearby center, where data-processing equipment prepares a summary report

EDP comes to the small shop

. . . or perhaps it should be said that the small shop comes to EDP. Here is how one company farms out its shop reports to a nearby electronic data processing center, gets back comprehensive reports on the performance of every man in the shop and the exact cost of every metalworking operation

By E H Hilliard, Jr, managing partner
Redfield Gunsight Co, Denver

Many small shops can't justify installation of data-processing equipment. But they still can profit from the tighter control over costs that electronic data processing makes possible. How? By sending shop reports to the nearest data-processing center. Major builders of this equipment maintain such centers in many large cities.

The Redfield Gunsight Co has done just this. As a result, after 51 years in business we have found a system that closely controls our largest cost element—labor. The system is so effective that we now know how many pieces an employee produces in a day, exactly how much he spent per piece, and what he did with the remainder of his eight-hour workday. Moreover, we get comprehensive monthly reports on labor performance, showing what it cost us to do each operation.

Our business is the manufacture of precision gun sights, mounts, and scopes. Because we must know precisely how much it costs us to produce these items, there can be no guesswork about labor expenses. But in recent years the problem of controlling this cost had magnified to the point where something had to be done.

Until recently, our labor reporting was quite informal. Each employee punched a time card when he reported for work and when he left. During the day he recorded, on a form pad, the number of pieces he produced. That was all the control we had over labor costs. And the business of later compiling statistics from these cards was a back-breaking job for our small clerical force.

Monthly production report that the author is examining was prepared at a nearby data-processing center. Report, which shows labor distribution and production averages, summarizes all shop operations at the plant during the previous month

Reporting labor performance

The new system, designed in collaboration with Remington Rand, is just about as simple as the old one. But here the similarity ends. What we did, with the help of the Univac Service Center, was to set up standard forms, understandable to our employees, that are also meaningful to the data-processing equipment.

Basic paperwork for the new system is two cards (see illustration) that employees fill in. Actually, the two cards are similar, except that one is blue (for employees assigned to general shop work) and the other is yellow (for those who do work on scopes).

When a worker arrives each morning, he takes the right-color card and fills in the date, his clock number, and his name. As the day progresses, he fills in other information for each operation that he completes: the

job number, the number of pieces he turned out, the time required, the number of acceptable pieces, and the number of scrapped parts (together with the reason for scrappage). If he requires additional space for this last item, he can write on the back of the card.

Our time standards, also entered on each card, show the number of pieces a worker should turn out during a given time. By glancing at a man's card, we can tell immediately whether his performance has been above or below standard for an operation.

Code numbers—about 1000 of them are in our system—describe each job and each operation. A loose-leaf notebook contains descriptions of what these code numbers mean (9001-1, for example, indicates a personal break). Every department in the shop has a listing of the numbers assigned to it.

At the close of the day, employees turn in their cards to lead men or supervisors. Each of our 13 departments has a lead man, who goes over all cards carefully and signs them to indicate his approval.

Next all cards are routed to the shop engineer, who checks the previous day's work every morning. Then the cards go to the pay office, where they are temporarily filed.

Processing labor reports

At the end of the month, the stack of daily cards that has accumulated is forwarded to the Univac Service Center, located in Denver. The Service Center keypunches and verifies a set of cards similar to ours. This information is punched into the cards: date, employee number, job number, operation number, hours worked, pieces produced, and pieces scrapped. These cards are then sorted by employee number and matched against a master deck that lists each worker's rate of pay.

At the center, the cards are computed for total labor cost. This procedure gives the cost of each operation on each job, actually breaking down the expenses to the cost of labor per piece produced.

The current month's cards also are computed against the previous month's cards, and the result is a new summary list. A similar process provides us with a quarterly production report that sums up activities for three months.

Speed and control

A major advantage of using the Service Center is the speed at which reports return: We get our monthly reports only three days after sending in our cards.

For a small shop like ours, the system is ideal. It gives us complete cost control over labor without investment in equipment that we would use only part of the time. It keeps clerical work at a minimum, and requires no specially trained personnel within our company. In short, we receive a modern data-processing job by merely buying time—not equipment.•

Stretch forming below zero

Cold working of metals at cryogenic (very low) temperatures improves their room-temperature strength. This principle is being used in the Ardeform process, developed by Arde-Portland, Inc, which has engineering offices at Paramus, N J and a plant at S Portland, Me.

In Ardeforming, cylinders are rolled and welded, cooled to –320 F with liquid nitrogen, and then stretched with gaseous nitrogen under high pressure. Stainless-steel rocket cases, so treated, have ultimate tensile strength of 260,000 psi after stretching 13%, a 25% gain in strength over a pressure vessel conventionally rolled, welded, heat-treated and expanded. Hence, process saves weight.

The process requires no heat-treating furnaces and so is not limited in size of product. First step is to make the "preform." If a cylindrical pressure vessel is involved, annealed sheet stock is rolled up, and seam welded. The cylinder is then placed in a "die," which is merely a cylindrical tank in a pit. Then the forming tank is filled with liquid nitrogen to a point well above the preform, which is clamped in place to avoid floating. Through a piping connection, the preform is filled with liquid nitrogen also. When the preform reaches the temperature of the liquid nitrogen (–320 F), high-pressure nitrogen gas is turned on to expand the preform. After removal, the stretched part is ready for final machining.

Cryogenically stretched pressure vessel is removed from pit fixture with gloves because temperature is –320 F

Nominal tensile strength of unstretched vessel is 102,000 psi; of stretched vessel, 260,000 psi. Weld strength is improved

No attempt need be made to control out-of-roundness, straightness or diameter dimensions of the preform, and no fixtures are needed to control weld shrinkage. Hence, crack-free welds with minimum residual stresses are produced. Ardeforming restores strength of weld metal to that of parent material. •

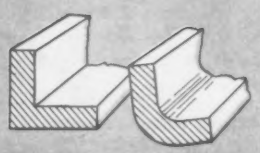
55 COST-CUTTING IDEAS

Second of a four-part series based on ideas collected by Harold Sizer, director of design at Brown & Sharpe, Providence, R I. Sole objective: to help designers and production men save valuable shop dollars

CASTING

Here are some foundry "do's" and "don'ts" for producing sound castings free from surface defects—and for insuring progressive solidification (molten and solidified metal must never come into contact with one another)

19



FILET SHARP ANGLES; otherwise, heat will concentrate on inside corners and a void will likely be the result

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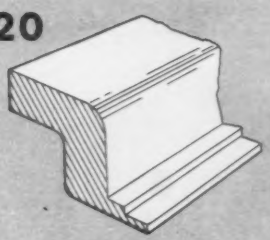
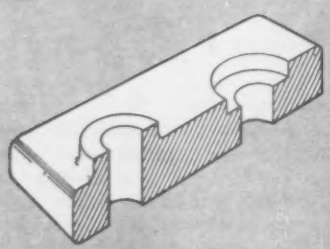


AVOID THIN SECTIONS that cool rapidly and thus quench the iron. This creates machining problems and ruins cutters

21

MAINTAINING EVEN PARTING LINES will bring economy in castings and usually increase accuracy. Irregular lines are troublesome to mold. Also, with only one parting plane, accuracy will increase, because surfaces approximately parallel to the parting plane will be the most accurate

22



PROJECTIONS ON CASTINGS require complicated molds, because they are formed by making recesses in the mold or, in more complex designs, adding loose pieces. Machined recesses instead of pads can eliminate pattern expense, so thought should be given to counterboring or spotfacing

23

WALLS AND RIBS should come in to successive intersections rather than all meet at a single point

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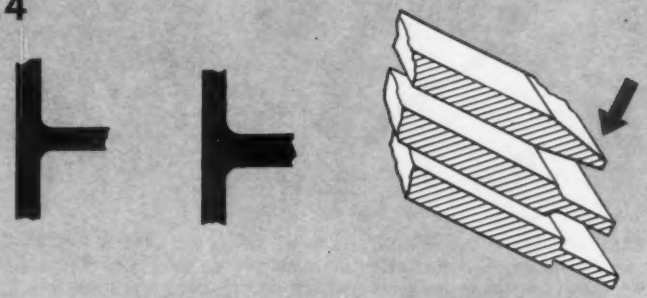

WALL THICKNESS is important for proper cooling. Inside walls should be about 9/10 of the outside wall. Also, minimize differences in thickness to produce quality castings, since gradual blends will help avoid distortion, cracks, and porosity

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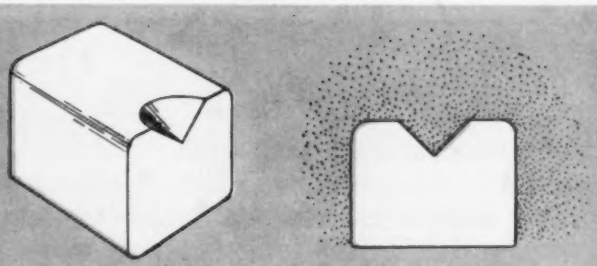

DRILL SPOTS, POCKETS, and other depressions in the casting are produced by small projections on the mold. Many times the force of the molten metal washes this sand away. Thus, during pouring, the expected economy is lost

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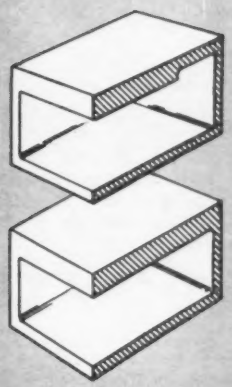

SIMPLIFY CORING to balance foundry savings against machining costs. While using cores may be economical in some instances, they cost more in complex designs. Consideration should be given to making two simple castings instead of one complex casting

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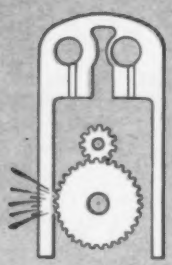

USE LIBERAL TOLERANCES whenever possible. Listed below are variations for several casting sizes. Do not design so that metal must be chipped or ground away

Width of Casting	Variation (±)
8 in.	1/16 in.
14 in.	3/32 in.
18 in.	1/8 in.
24 in.	5/32 in.
30 in.	3/16 in.
36 in.	1/4 in.

MACHINING LARGE CASTINGS

Avoid machining large castings, because they are heavy and awkward to move, and setup time is high. High-burden-rate machines should be freed by putting the bulk of machining operations into secondary members bolted to the basic machine

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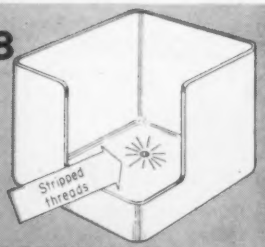
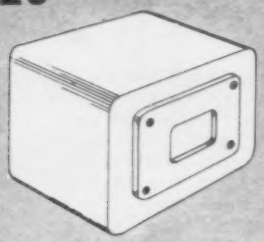
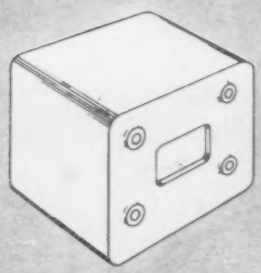


SAVE REPAIR COSTS by not threading large castings. Rather, threads for bolting should be put in secondary members

55 COST-CUTTING IDEAS

29





USE SMALL BOSSES rather than extensive pads to mount electrical compartments. Machining time will be greatly reduced

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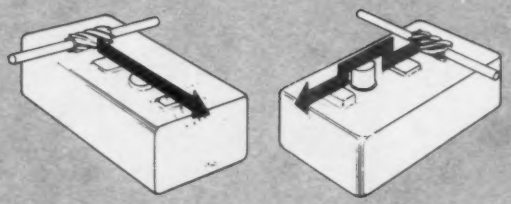

PADS AND PROJECTIONS ON THE SAME LEVEL will allow machining the surfaces in one sweep. Unless the pads are so designed, higher costs will result from changing and repositioning the cutter and workpiece

MILLING

With a little foresight, design personnel can take a large load off the shoulders of milling machine operators. Some typical ideas are presented here, and others on the subject will follow in the next installment of this four-part series

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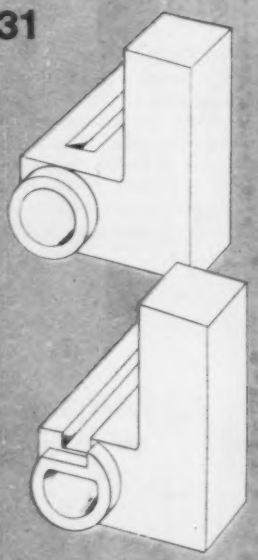

RUN-THROUGH MILLING will reduce costs if allowance is made for run-by. Otherwise, it is often necessary to plane rather than mill

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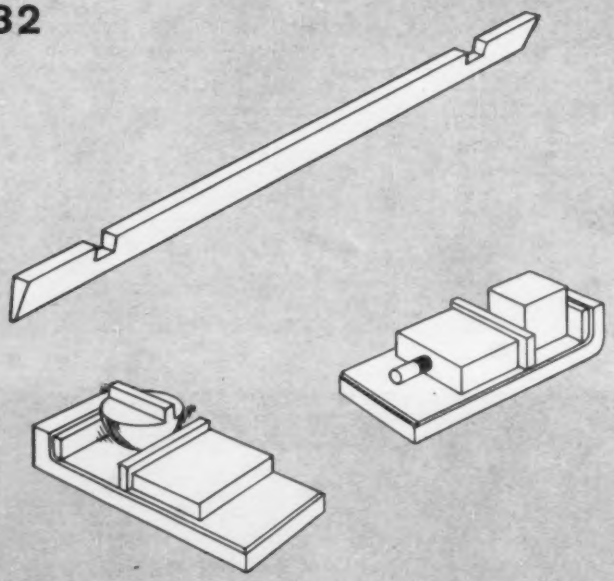
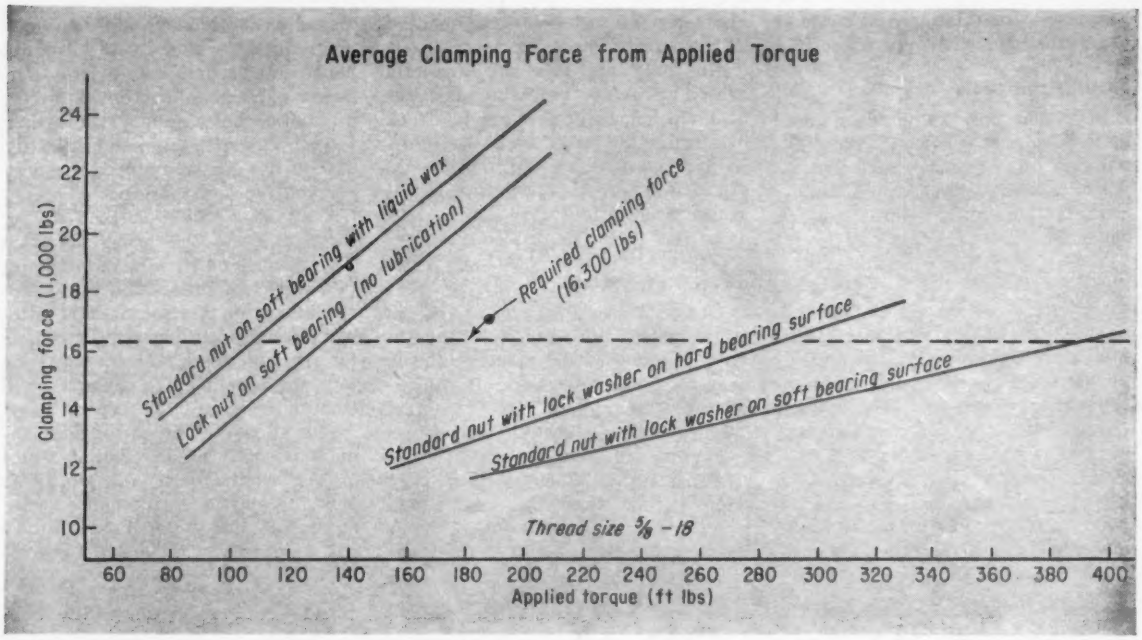


SETUP PROBLEMS ARE SIMPLIFIED if the designer thinks ahead. Long, light flexible parts need solid support and usually require costly holding fixtures or reduced feeds. Spherical-shaped parts are hard to clamp and often need expensive fixtures; block-shaped parts are easier to hold


Average Clamping Force from Applied Torque
Clamping force (1,000 lbs)
24
22
20
18
16
14
12
10
Standard nut on soft bearing with liquid wax
Lock nut on soft bearing (no lubrication)
Required clamping force (16,300 lbs)
Standard nut with lock washer on hard bearing surface
Standard nut with lock washer on soft bearing surface
Thread size 5/8 - 18
60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400
Applied torque (ft lbs)

Torque-tension relationship can solve other problems, as the two examples above show. For this ⅝-in.–18 bolt, 16,300 lb (dotted line) was established as necessary clamping force. Addition of lubricant (left) induces 2,400 lb more clamping force in bolt. At right, plot shows an extra 100 ft-lb is needed to overcome friction of a soft bearing surface

Tool and tension tests insure quality control

Checking up on bolt tightness

Like one rotten apple in a barrel, one loose bolt in an assembly can do a lot of harm—especially if the end product must undergo rough service and heavy strain.

Massey-Ferguson Inc assembles just such a product at its Detroit plant—tractors—and thread tension testing has become an exact science there.

Basically, Massey-Ferguson insures a secure fit by (1) determining precisely how tight each bolt should be, (2) checking each impact tool to make sure it can deliver the required power, and (3) inspecting the impact tools regularly.

Results of this system:

- Assembly is more reliable (because each tool is known to be up to its job).
- Less inspection is required on the finished assembly (because the *tools* are inspected regularly).
- Lower upkeep cost for tools (a small variety of dependable tools can be adjusted to solve all assembly problems).
- A smaller parts inventory.

Checking of required tension for each bolt, and of the ability of an impact tool to deliver the needed power, is done on a single instrument —a torque tension tester made by Cleveland's Skidmore-Wilhelm Mfg Co which gives precise measurement of clamping forces as high as 30,000 lb.

How tight?

To find out exactly how tight each bolt in a tractor should be, Massey-Ferguson first set up tension standards for every threaded fastener used in the plant (based on 85% of yield), then established precise torque-tension relationships for each bolt assembly.

This was done by selecting a sampling of nuts, bolts, and washers from those actually used at each station on the production lines. An assembly was then inserted in the tester (to simulate the actual production joint), and each bolt tightened with a hand torque wrench until the prescribed clamping force was indicated on one of the instrument's two direct-reading gages. At this point, the torque necessary to produce this pressure was read from the torque wrench.

Direct-reading tension gage shows the induced clamping force after power tool has tightened a test bolt for three seconds

After enough production assemblies from the same station were tested to produce a consistent reading (six were usually needed), tension torque figures were recorded.

This procedure was then repeated with each assembly, until precise

torque-tension relationships could be established for each type of bolt.

Testing the tools

Now that they knew the amount of tension needed for each bolt, M-F engineers had to make sure that individual impact tools could deliver the right amount of power to give each joint the exact bolt load.

First, special hardened-and-ground alloy steel master test bolts were threaded into special nut bushings on the tester. Then the test assemblies were tightened for 3 seconds by power tools governed by automatic time interval controls. The average ("norm") of three such tension readings was then logged for each tool.

After each of the company's 550 impact tools has been so tested, a handy notebook was prepared, showing the make, size, and number of the tool; the test bolt size, and the output norm.

Not only did this show exactly which tool to use with which fastener —it also made it possible to check the output performance of any power tool against the norm in the book. Thus, if a tool didn't measure up, it could be adjusted or repaired. Or a new part might be needed.

Tool standardization

Out of Massey-Ferguson's program of periodic tool inspection (and careful recording of the results of each inspection) have come some conclusions that help maintain high product quality while holding down production costs.

For instance: Some tools require more maintenance than others, and the company through its records has been able to standardize on the three makes of tools which are easiest to maintain. Also, as more tool maintenance data accumulates, Massey-Ferguson expects to cut down on the number of tool suppliers still further.

And, of course, this standardization of tools has greatly reduced the number and types of spare parts.

Every new tool is checked out for three days on the tester before it goes to work on the line. Then, after two weeks of production duty, it is rechecked on the tester. This latter test includes disassembly (to look for signs of wear), and investigation into the cost of such parts as will eventually have to be replaced.

This allows the purchasing department to analyze each tool in terms of (1) original cost, (2) ability to perform, and (3) maintenance cost— as good a guide as possible for future tool buying. •

Cutting ID and OD threading time 70%

By E L Fester, president, M-D Blowers Inc, Racine, Wis

One of the more expensive jobs in our plant involved threading heat-treated alloy-steel shafts, ductile-iron rotor-shaft assemblies, and internal threading of large pipe flanges. For external threading we tried a collapsible die head in a turret lathe, but the closeness of the shoulder gave us trouble, and we had excessive scrap.

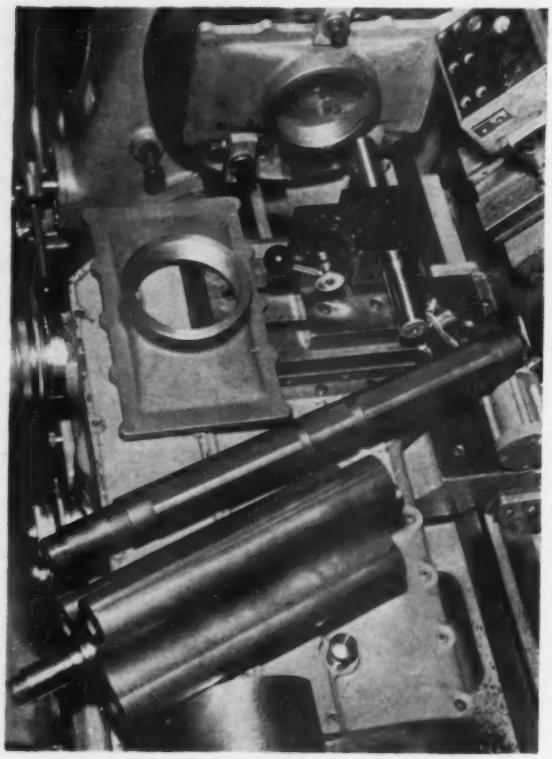
We shifted the job to an engine lathe run by one of our best operators and did the job with single-point tools. The resultant quality was excellent and scrap was 'way down, but the cost per piece remained about the same because of the increased time involved. For the flanges, on which we had to face and chamfer the end, and taper bore and chamfer the ID before threading, we shifted to an engine lathe with a tracer attachment, but this did not appreciably reduce costs.

During a visit to the ASTME show in New York, we saw a Gisholt Cri-Dan B lathe in operation, and it seemed like the answer to our problem. After talking it over thoroughly, we installed the machine in our production department, trained a regular operator to use it and, within a month, had reduced machining time by 70% and cut scrap loss to a minimum.

How we did it

For the flanges we installed a faceplate fixture and a facing slide that carries a tool block with automatic relief for the return stroke, and a pusher device for boring from the longitudinal slide. On the threading slide we mounted a dovetail block to permit fast interchange of preset boring, chamfering, and threading tools. No special equipment is needed for taper cutting. The 8 tpi 60° pipe thread is generated in 16 automatic passes. Floor-to-floor time on a 5-in. flange is 5.5 min; on a 4-in. flange, 3.5 min.

For the alloy-steel shafts and ductile-iron rotor assemblies, 16 to 28 in. long, we hold the work in an air chuck and support it on the tailstock. The tool block is retractable to simplify loading and unloading. Times run from 0.45 to 0.7 min floor to floor. •

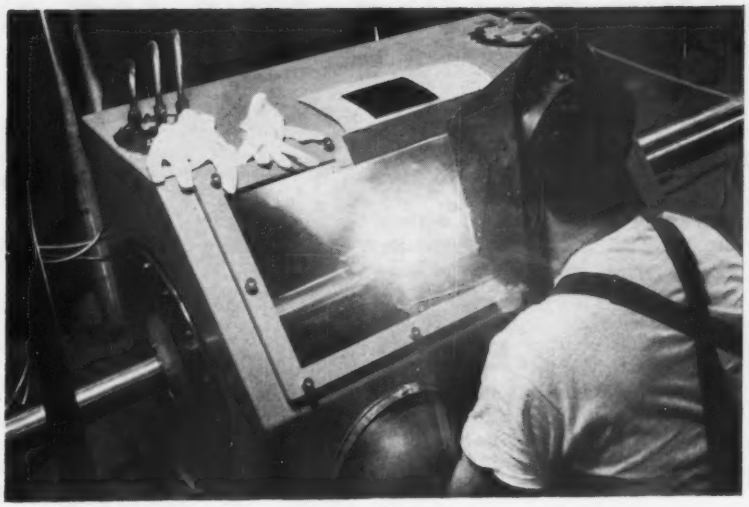


One machine, a Cri-Dan B, threads these and other parts with a 70% time saving. Rear slide faces and chamfers flange OD, then cross feed is disengaged and pusher feeds boring bar to cut taper and chamfer ID. Cross feed is engaged and pipe thread is cut in 16 automatic passes. Shafts are held in air chuck with tailstock support, threads cut in 0.45 to 0.7 min

'Kid glove' welding of zirconium

...Well, not exactly kid gloves. But cleanliness is so important in successful welding of this tricky metal that the operator wears white gloves for setup

By J T Maloney,
manufacturing research engineer
Rohr Aircraft Corp, Chula Vista, Calif



Small purge chamber encloses one joint at a time for Tig-welding long zirconium tube. High-purity argon, cleanliness, and controlled heat input help make good welds

A portable purge chamber and high-purity shielding gas (argon with a dewpoint of –95 F) are largely responsible for Rohr Aircraft's success in welding zirconium. Other critical factors in welding this tricky material: extreme cleanliness and controlled heat input.

Rohr recently had the job of building up three sections of zirconium tubing and welding a fitting to each end to make a 27-ft-long fuel and coolant tube for a new pressurized-water test tube reactor at National Testing Station, Idaho Falls, Idaho. General Electric Co was the customer.

Primary requirement in joining the sections was 100% weld penetration with absolutely no voids or inclusions. Straightness of the welded assembly was important, too, because the tube fits inside an aluminum shroud in operation. Straightness tolerances over the 27 ft were 0.005 to 0.010 in., tir.

Wall thickness of the 4⅜-in.-OD tubing was 0.470 in., making relatively heavy sections that would ordinarily require a huge vacuum chamber or a large purge box. Rohr, however, welded each joint inside a portable purge chamber, with the zirconium tube extending through sealed ports at each end and resting on V-supports along its length.

White-glove setup

Cleanliness was very important, so the operator wore white gloves to make the setup, after thoroughly degreasing and wire-brushing the sections to be joined. Once the setup and purging were complete, he performed the Tig (tungsten, inert-gas) welding operation with his hands inside the Neoprene gloves sealed to ports in the chamber.

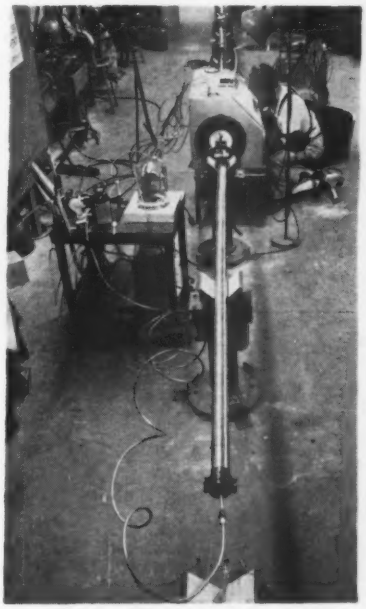
Because zirconium is extremely sensitive to prolonged high temperature, the operator welded for only about 10 minutes at a stretch, rotating the tube manually. In this time he could weld about 4 inches and then had to stop for 20 minutes or so to let the tube cool down to room temperature.

With 8 passes required at each joint, it took about 6 hours to weld two sections together. A Hobart arc-welding machine supplied straight-polarity, d-c current, and the weld was made with ⅛-in.-dia Zircaloy-2 rods as filler metal. After one joint was welded, the purge chamber was moved on to the next where the process was repeated.

Welds pass rigid tests

Of course, 100% X-ray inspection was made at each joint to be sure there were no inclusions, porosity, or other defects. Physical tests have shown a weld strength of 80,000 psi, tensile, with 15% elongation and 45,000 psi yield. Hardness of the parent metal was Rh 92K, with an average of 91.5 in the weld and 92.5 in the heat-affected zone.

A high degree of purity in the shielding gas is accomplished by passing high-purity commercial argon (–80 F dewpoint) through a molecular-sieve dryer and from there through a scavenger unit, where a stainless steel tube packed with zirconium shavings is heated to 1650 F. This picks up hydrogen, nitrogen, or other residual gases that might otherwise pass through the dryer.



Argon fills inside of long plugged tube to back up the weld with inert atmosphere

Then, to make sure the argon is pure enough, it is checked in a Rohr-designed tester. Here, a strip of titanium foil, 0.001 in. thick, is heated to 1650 F for 30 seconds in the dried gas. At this temperature, the titanium glows orange-red but when it cools down to room temperature, it must be clear and shiny. Discoloration would indicate impure gas. •

Simple die mechanism does the trick

'Skip piercing' strip-fed stock

By Emil Loeffel, tool engineer
H K Metalcraft Co
New York

Sometimes the simplest of devices can be as effective and as versatile as a complex, specially tooled machine in performing a difficult metalworking job.

A case in point is a simple die mechanism which produces a hole in every other piece as strip is fed through a press. With a few adjustments, the mechanism (see drawing) can also be made to:

- Pierce every *third* piece if the indexing and holding notches are changed accordingly. (In fact, this mechanism will pierce holes farther apart than the capacity of available press feeds if the press is set to cycle a given number of times between piercing strokes).
- Form pieces, stamp numerals, or do similar pressforming jobs.
- Produce right-and left-hand parts in the same die during the same run.

How it works

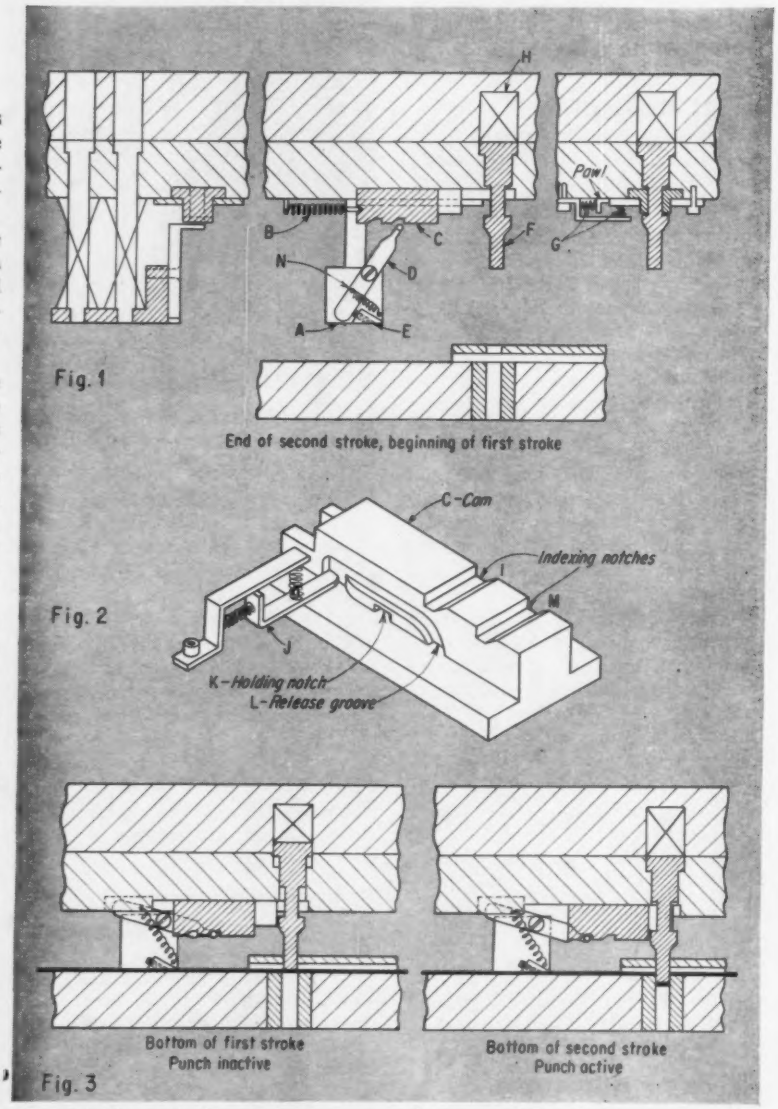
On the first stroke, the punch is inactive (See Fig. 1, which shows the mechanism at the beginning of the first stroke). As the die closes, spring pad *A* comes into contact with the die block, and indexing arm *D* enters the indexing notch *I* (See Fig. 2).

Cam *C* is moved, against the pull of spring *B*, toward punch *F* until the indexing arm *D* is in a horizontal position.

At this point, pawl *J* (held in position by springs *G*) enters holding notch *K*. Now the cam is locked in position. Further closing of the die causes the indexing arm to retract from the indexing notch (See Fig. 3).

Punch *F* has already come into contact with the material being stamped and slides back into the die shoe, compressing light spring *H*. During the upstroke, punch *F* and spring pad *A* return to their normal positions, and spring *N* returns the indexing arm to adjusting screw *E*.

At this point, a full stroke of the press has been completed—during which the piercing punch was inactive, and the cam was advanced one notch.



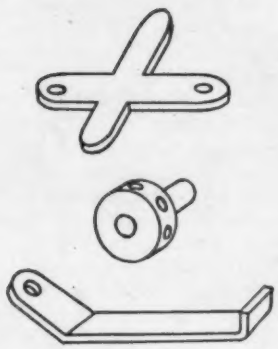
Versatile die mechanism pierces every second piece, or skips as many pieces as desired before piercing (See text for key to reference letters)

As the die again closes, cam *C* is pushed into position by notch *M* to support punch *F*. Punching through the material begins when the indexing arm is at, or just past, its horizontal position.

Thus the cam is not forced to move while it is supporting the punch. During the cam movement, pawl *J* moved out of holding notch *K* and now lies in release groove *L*, freeing the cam. As the die opens, indexing arm *D* remains in the indexing notch *M* until just before spring pad *A* leaves the die block. At this instant, the cam is pulled by spring *B* to its initial position. The mechanism is now in position to go through another non-piercing cycle, because indexing arm *D* will enter notch I. •

American Machinist / *Metalworking Manufacturing*

Special Report No. 510 Sept 4, 1961



HOW TO ESTIMATE

DIES, JIGS, and FIXTURES

FROM A PART PRINT

By Leonard Nelson, planning process engineer
Industrial Engineering Dept, Brown Instruments Division
Minneapolis-Honeywell Regulator Co

How long will it take—how much will it cost—to build a die, jig or fixture for a job?

An accurate estimate can be made in a matter of minutes while the job is still fresh off the drawing board, and before it has been released to production.

All that's needed is a part print, the tables in this article, and some knowledge of tool construction. Not only will this method determine the time and cost of tooling, it can determine which of several different methods of making tooling will be the fastest and most economical.

A small oversight or two won't impair the accuracy of the calculation, which is actually so simple that the burden of estimating can be turned over to an assistant.

Essentially, this method estimates tool cost in terms of hours, but it is easy to apply the shop rate to the time estimate to get probable tool cost for any given job. And, with a little more figuring (based on production rates, burden rate, and material costs), piece-part costs can be determined.

This shorthand guide to tooling estimation can be especially valuable to the shop man or engineer who must give on-the-spot estimates to part designers. In other words, this method is so fast and so accurate that the most economical and efficient part design can be determined while there is flexibility with respect as to how a part or product will be made—the modern way of attaining low overall costs.

How reliable *is* this estimating method? The data have not only been collected, checked, and rechecked over a period of years at Minneapolis-Honeywell, but have been used in other plants.

At first, actual tool building times may be on the high or low side compared to the estimate, but the deviations will be consistent. All that's necessary is to determine a suitable constant based upon *your* conditions.

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Section I—How to Estimate Dies

By looking at the part print and referring to the tabulated time data in this guide, you can estimate the hours required to build a "basic" die or a "combination" die. The word "basic" refers to a die that performs only one function. For example, a basic pierce hole die only pierces holes; a blanking die does only blanking. A combination die might pierce and blank or be a multiple-station progressive die.

Examples are provided for estimates of basic and combination dies, so that you can see how the tables are used.

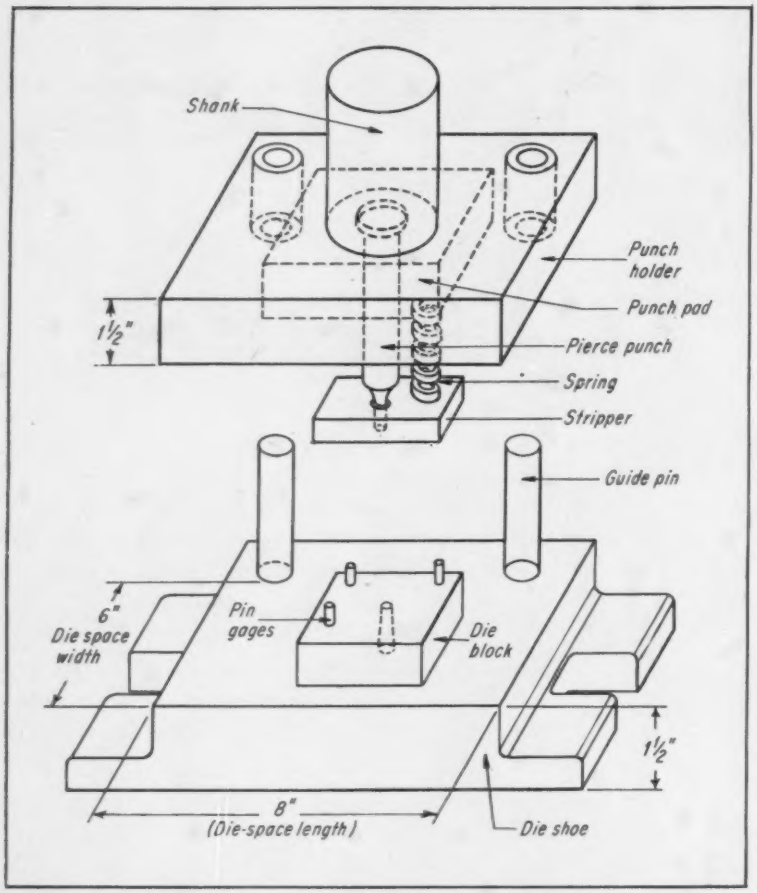


Fig. 1—Time data for a basic pierce hole die are given for a tool that does not exceed these physical limits. If the required die is larger, add 10% to compensate for extra handling that will always be involved

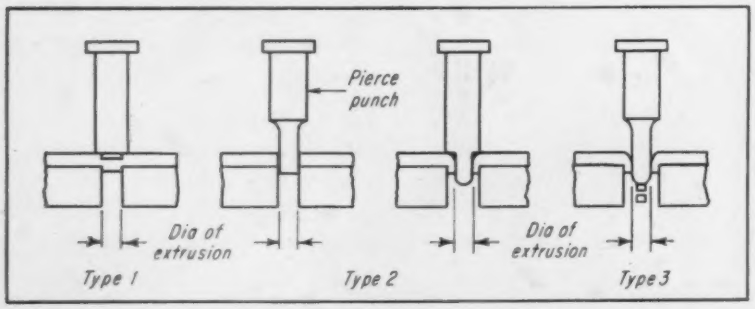


Fig. 2—Basic extrusion dies may push the metal part way out of the sheet, Type 1, or pierce a hole and extrude a collar or eyelet, Types 2 and 3

Physical Limits of the Die

(Both Basic and Combination)

All time values given in the tables are based upon the construction of a die to these specifications:

1. The punch and die will be made of oil-hardening tool steel.
2. Punch and die blocks will be machined square, then ground before and after heat treatment.
3. These punch and die blocks will be mounted with screws and positioned with dowels.
4. The punch and die blocks will be assembled on the surface of the die shoe and punch-holder of the die set.
5. Time values are included in the estimate for die accessories such as gages, nests, strippers, punch pads, locating pins, spring pins, stops, knockouts, and pressure pads.
6. The minimum tolerance allowed for all dimensions will be ±0.002 in.
7. Material thickness will range from 0.010 to 0.250 in.
8. Physical limits of the die set will not exceed 1½ in. in thickness for die shoe and punch holder, and the assembling space will not exceed 6 in. in width by 8 in. in length.

Additional time is necessary under these circumstances:

1. Add 20% when high-carbon, high-chrome steel is used instead of oil-hardening tool steel. The extra time is required because of the difficulty encountered in the drilling, machining, and grinding.
2. Add 25% when the blank thickness is less than 0.010 in. More time is needed because the clearance between punch and die is extremely close, and extra care is required in the fitting, filing, and stoning of the punch and die.
3. Add 10% when the die set is milled to fit the die blocks. Usually, milling is employed when material thickness is greater than ¼ in., to insure stability of the die blocks.
4. Add 10% when the physical limits of the die set, as stated above, are exceeded. More time must be allowed to compensate for the extra handling and drilling of the die set.

Basic Hole Piercing Dies

Hole-piercing dies can be classified into three types, according to hole diameter.

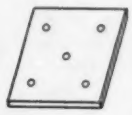
Type	Size Range
1. Small	0.0156 - 0.1245
2. Medium	⅛ - ½
3. Bored	Over ½

The time values in Table 1 are

Calculations for Basic Piercing Dies (see Table 1 for basic data)

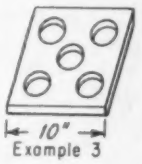
Example No. 1—To pierce five 0.031 in. dia holes in 0.009 in. stock. Oil-hardening tool steel (OHTS) die

Estimate:
One basic die (small pierce hole) 21
Four additional holes (4 x 3.5) 14
35
Material thickness allowance (25% of 35) 9
total ..... 44 hr


Example 1

Example No. 3—To pierce five 0.745 in. holes in 0.188 in. stock. HCHC die, and extra-large die set.

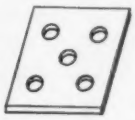
Estimate:
One basic die (bored hole) 21
Four additional holes (4 x 9) 36
57
Allowance for HCHC die, 20% 11
Allowance for die set, 10% 6
Allowance for extra handling at 10% 6
total ..... 80 hr



Example 3

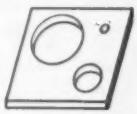
Example No. 2—To pierce five 0.250 in. holes in 0.031 in. material. High-carbon high-chrome (HCHC) steel die

Estimate:
One basic pierce-hole die 16
Four additional holes (4 x 2.5) 10
26
Allowance for HCHC die (20% of 26) 5
total ..... 31 hr


Example 2

Example No. 4—To pierce one 0.031 in. hole, one 0.250 in. hole and one 1.250 in. hole in 0.031 in. material. OHTS

Estimate:
One basic die (small pierce hole) 21
One additional pierce hole 2.5
One additional bored hole 9
total ..... 32.5 hr


Example 4

based upon the diameter of the hole. Holes from a 1/64 to 1/8 in. are designated as "small pierce holes." Time values are greater than for medium pierce holes because of the extra care in drilling the die block, to avoid drill breakage, and the extra time for grinding and making the pierce punch. Holes with diameters of 1/64 - 3/64 in. require a special quill-type punch and holder.

Holes from ⅛ - ½ in. dia are designated as "pierce holes." Time values are based on the ease of drilling the die blocks, and the fact that standard drills are available.

Holes larger than ½ in. dia will be designated as "bored holes." Time values are based on the need to bore the hole in the die block, coupled with the extra time for grinding and machining the larger pierce punch.

Basic Blanking Dies

Blanking dies are estimated according to the periphery of the blank. The contour of the blank will be made up of one or a combination of the four different types of contours:

1. Straight lines
2. Angular lines
3. Curved lines that cannot be bored
4. Irregular lines

Time values for basic blanking dies are given in Table 2. Note that times

Table 1—Time Values for Basic Pierce Hole Dies

(Oil Hardening Tool Steel)

Hole Dia In.	Hr for Basic Die (one hole only)	Hr for Each Additional Hole
	Small Holes	
0.0156 - 0.1245	21	3.5
	Pierce Holes	
0.125 - 0.500	16	2.5
	Bored Holes	
0.501 - 1.000	21	9.0
1.001 - 1.500	31	10.0
1.501 - 2.000	33	12.0
2.001 - 2.500	36	15.0
2.501 - 3.000	39	18.0
3.001 - 3.500	42	21.0
3.501 - 4.000	45	24.0
4.001 - 4.500	48	27.0
4.501 - 5.000	51	30.0
5.001 - 5.500	54	33.0
5.501 - 6.000	57	36.0

Extra Allowances:

If die is to be made of HCHC steel ..... Add 20%
If material thickness is between 0.001 - 0.009 in ..... Add 25%
If die set is milled to fit die blocks ..... Add 10%
If die shoe and punch holder are over 1½ in. thick and die set greater than 6 x 8 in., for extra handling ..... Add 10%

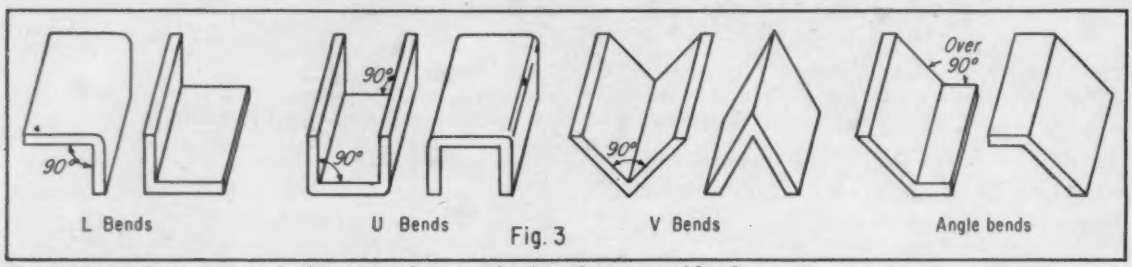


Fig. 3—Time values are given for basic form dies to make these four types of bends

Time Values for Three Types of Basic Dies

Table 2—Basic Blank Dies, Hr

(Oil-Hardening Tool Steel)

Periphery In.	Contour of Blank			
	Straight	Angular	Curved	Irregular
Up to 3	24	27	30	37.5
3 to 4	27	32	40	50.0
4 to 5	29	38	50	62.5
5 to 6*	32	45	60	75.0

*If periphery is greater than 6 in. use these values for every inch:

Straight line	5.0
Angular line	7.5
Curved line	10.0
Irregular line	12.5

Examples: Periphery 7 in., straight line: 7 × 5 = 35 hr
Periphery 7 in., curved line: 7 × 10 = 70 hr

When blank is a combination of contour lines:

I — Periphery is less than 6 in:
Straight and angular lines — Sketch A, use "Angular" column
Straight, angular and curved — Sketch B, use "Curved" column.

II — Periphery is greater than 6 in:
Combination of contours — use combination-dies section
Circular and straight lines — Sketch C, use "Straight" column.

Table 3—Basic Extruding Dies, Hr

(Oil-Hardening Tool Steel)

Dia of Extrusion	Type 1		Type 2		Type 3	
	Basic Die	Each Add'l	Basic Die	Each Add'l	Basic Die	Each Add'l
0.0156 to 0.1245	20	7.5	28	15.0	24	10.0
0.125 to 0.500	16	5.0	24	10.0	20	7.5
0.501 to 1.000	20	10.0	28	20.0	24	15.0

Table 4—Basic Form Dies, Single Bends Only, Hr

(Oil-Hardening Tool Steel)

Length of Bend	Width of Bend	90° Bends			Angle Bend
		L	U	V	
Up to 1	Up to 1	30	30	30	40
Over 1 to 2	Up to 1	32.5	32.5	32.5	43.5
Up to 1	Over 1 to 2	32.5	32.5	32.5	43.5
Over 1 to 2	Over 1 to 2	35	35	35	47
Over 2 to 3	Over 2 to 3	40	40	40	54

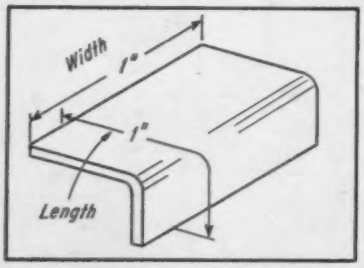


Fig. 4—Tabulated data are given in terms of variations from this "standard" size of 90° or L bend

are based on use of oil-hardening tool steel. Add 20% if high-carbon, high-chromium steel is selected.

Basic Extruding Dies

Basic extruding dies can be estimated according to the hole diameter of the extrusion and the type of extrusion. Consider three types of extrusions. (See Fig. 2):

1. An extrusion without a pierced hole.
2. An extrusion with a pierced hole requiring two stages for completion. First-stage piercing is followed by an extruding stage.
3. An extrusion with a pierced hole done in one stage.

Time values for basic extrusion dies are given in Table 3.

Basic Bending or Forming Dies

A basic forming die can be estimated according to the width, length and type of bend. Types of bends are

classified in Fig. 3. Most forms are 90° bends. The L, U, and V forms are variations of the 90° bends. An angle bend is a bend other than 90°.

Time values are based on a standard form die for a part that contains a bend 1-in. wide by 1-in. long. See Fig. 4. All 90° bends that are less than 1-in. wide and less than 1-in. long will use the same value as the standard form die. For bends wider than 1-in. or longer than 1-in., an additional 2.5 hr per inch of width or length will be added to compensate for the additional machining, grinding, drilling, and assembling of larger form blocks. For angle bends, an additional 3.5 hr per inch of width or length will be added. Table 4 applies to one bend only of each type; if there are more than one, use Table 8.

How to calculate combination dies

For dies that perform more than one function, is necessary to estimate the time for each function and then add the figures obtained for the various functions. See the "Index for Time-Data Tables."

With these tables, it is possible to compare tool costs for different methods. See Example 1. Here two methods are compared.

• Method 1 employs a progressive die. The tool cost in terms of time is 133 hr.

• Method 2 involves use of three dies: pierce and blank, form two ears and the end, and final form. Here the tool-building time is 48.5 + 45 + 30 = 123.5 hr.

Thus, the progressive die requires only 9.5 hr additional to build and may well provide the lowest over-all piece-part cost.

Example 2 discusses a problem of piecing, blanking and forming that can be done by three methods. The second method has a distinct time advantage over the other two proposals.

Availability of time data therefore stimulates the estimater to consider several methods for making a part. And within a few minutes he is often able to show the cheapest method for making the part, so far as tooling cost is concerned, and to give a good guess of the actual piece-part cost. Such information is invaluable when the process engineer and the product designer are working together on manufacturing feasibility studies.

Time Values for Combination Dies (OHTS)

(Use these values for calculating the stations)

Table 5—Pierce Holes & Pilots in Combination Dies

Type of Hole	Hole Dia	Pierce Holes Estimated Times, Hr	Pilots
Small	0.0156-0.1245	7 hr/hole for the first five holes. For each additional hole thereafter add 3.5 hr/hole.	3.5
Pierce	0.125-0.500	5 hr/hole for the first five holes. For each additional hole thereafter add 2.5 hr/hole	2.5
Bored	0.500-1.000*	10 hr/hole for the first five holes. For each additional hole thereafter add 5.0 hr/hole.	5.0

*For holes greater than 1 in. dia, refer to Table 1, column marked, "Estimated Hr for Each Additional Hole".

Index to Time-Data Tables for Combination Dies

Type of Die	Use Tables			
	5	6	7	8
Pierce & Blank	X	X		
Pierce, Extrude & Blank	X	X	X	
Pierce, Extrude, Blank & Form	X	X	X	X
Pierce, Cutoff & Form	X	X		X
Pierce & Cutoff	X	X		
Form (more than one bend)				X
Pierce, Extrude & Cutoff	X	X	X	

Table 6—Blanking Stations in Combination Dies

Periphery	Contour of Blank			
	Straight	Angular	Curved	Irregular
Up to 3"	For odd-shaped blanks regardless of contour within blank, use a minimum of 15 hr/hole; if there are more than three similar holes, use 10 hr/hole thereafter.			
Over 3"—Add per inch of periphery	5.0	7.5	10.0	12.5

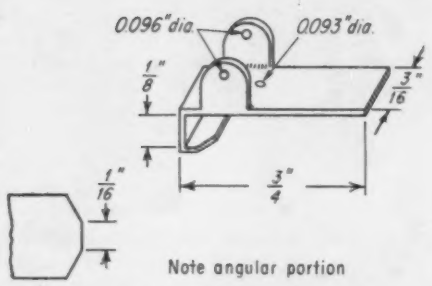
Table 7—Extrusions in Combination Dies

Extrusion Dia	Type 1	Type 2	Type 3
0.0156-0.1245	7.5	15.0	10.0
0.125 -0.500	5.0	10.0	7.5
0.501 -1.000	10.0	10.0	15.0

Table 8—Bends or Forms in Combination Dies

Length of Bend	Width	90° Bends	Angle Bends
Up to 1 in.	Up to 1 in.	15 hr/bend	20 hr/bend
Over 1 in. of length or width—Add for every 1 in., either length or width—2.5 hr for 90° bends and 3.5 hr for angle bends.			
Additional Allowances			
HCHC	Add 20%		
Thin Material	Add 25%		
Mill Die Set	Add 10%		
Extra Large Die Set	Add 10%		

Calculations for Combination Dies



Example 1—Made by Two Methods

Method 1—Progressive Die

Item	Reference Table	Calculation	Hr
3 small holes	Table 5	7 x 3	21
8 small pilots	Table 5	8 x 3.5	28
1½ straight outline	Table 6	2 x 5	10
2 pierce holes (tabs)	Table 5	2 x 5	10
½ in. of angle	Table 6	½ x 7.5	4
4—90° bends	Table 8	4 x 15	60
		Total	133

Method 2—Three Dies

Pierce and Blank Die

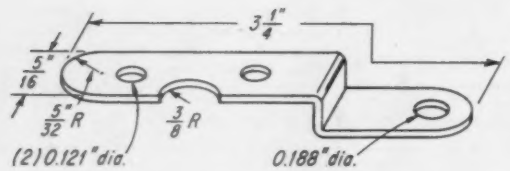
3 small holes	Table 5	7 x 3	21
1 small pilot	Table 5	1 x 3.5	3.5
1½ in. of straight	Table 6	2 x 5	10
2 pierce holes (tabs)	Table 5	2 x 5	10
½ in. of angle	Table 6	½ x 7.5	4
			48.5

Form Die (2 ears and end)

3—90° bends	Table 8	3 x 15	45

Final Form Die

Basic form die	Table 4	1 x 30	30
		Total	123.5



Example 2—Made by Three Methods

Example 2—Material 0.031 in. Brass

Item	Reference Table	Calculation	Hr
Method 1—Blank, Pierce and Form Die			
2 small holes	Table 5	2 x 7	14
4 small pilots	Table 5	4 x 3.5	14
3 pierce holes	Table 5	3 x 5	15
½ in. of curve	Table 6	½ x 10	5
6 in. of straight	Table 6	6 x 5	30
2—90° bends	Table 8	2 x 15	30
2 in. length	Table 8	2 x 2.5	5
			113
Method 2—Pierce, Cut-off, and Form			
2 small holes	Table 5	2 x 7	14
2 small pilots	Table 5	2 x 3.5	7
3 pierce holes	Table 5	3 x 5	15
½ in. of curve	Table 6	5	5
2—90° bends	Table 8	2 x 15	30
2 in. length	Table 8	2 x 2.5	5
			76

Method 3—Two Dies

Pierce and Blank Die

2 small holes	Table 5	2 x 7	14
2 small pilots	Table 5	2 x 3.5	7
3 pierce holes	Table 5	3 x 5	15
½ in. of curve	Table 6	5	5
6 in. of straight	Table 6	6 x 5	30
			71

Form Die

Basic die			
2—90° bends	Table 8	2 x 15	30
2 in. length	Table 8	2 x 2.5	5
			35

Total = 71 + 35 = 106

Section II – How to Estimate Jigs and Fixtures

This section is a "short hand" guide for determining the number of hours necessary for a toolmaker to build a jig or a fixture.

Jigs and fixtures are used to produce duplicate, interchangeable parts. This aim is accomplished by accurately locating and holding each piece in an identical position in the jig or fixture.

Time-determining factors in building a jig or a fixture are: size of the part to be held, its length, width and height. From the part print we determine the general appearance and shape of the work, the number of operations to be done, and the approximate dimensions of the jig or fixture.

Five basic components of a jig or a fixture are (See Fig. 5):

1. A baseplate or mounting plate— The baseplate is comparable to the die set in the die making. All fixture blocks are assembled on the baseplate by means of screws and dowels.

2. A locating means—The part is located accurately by pins, edge-locating blocks or nests, or V-blocks.

3. A clamping means — Several kinds of clamps are used: thumbscrews, knobs, quick-acting hand-operated clamps, and power-operated clamps.

4. A positioning means — Desired relationship between the cutting tool and a jig or fixture is established by a drill plate; in a fixture a set block would be the positioning means.

5. Tool guides or bushings— These are used in jigs for drilling and reaming holes accurately.

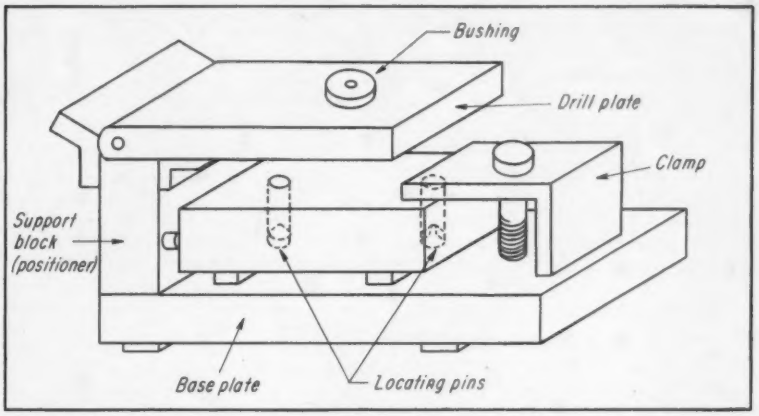


Fig. 5–Basic components of a fixture. Time values are tabulated for the various parts

Classification of Jigs and Fixtures

As many as 40 or more types of fixtures will be used in a large plant. They are named according to the operation performed, for instance:

Assembly, staking, testing, locating, holding, positioning, alignment, drill, lathe, milling, reaming, tapping, grinding, turning, etc. For our purposes, let's put fixtures into four groups:

1. Drilling fixtures ....Drill press
2. Milling fixtures....Milling machines
3. Bench fixtures.....Bending & burring
4. Turning fixtures .. Lathes, turret lathes

Time allowance to machine a purchased faceplate, to make a turning fixture, is 6 hr.

Physical Limits of Jigs and Fixtures

All tabulated time values are based upon construction of a jig or a fixture to the following specifications:

1. The steel employed for the baseplate is either hot or cold-rolled steel (HRS or CRS).

2. Locators, clamps, positioners, and tool guides (with the exception of the drill plate and supporting blocks) will be made of oil-hardening tool steel (OHTS).

3. All blocks will be machined square and ground.

4. All blocks will be positioned by dowels and fastened with screws.

5. Part-size limits will be 6 in. wide by 6 in. long, or 6 in. dia by 3 in. high, and these limits apply to parts that are flat, round or a combination of both and tubing.

6. Physical limits of the mounting plate will not exceed 1 in. thick by 12 in. wide by 12 in. long.

7. The minimum tolerance for jig boring will be ± 0.0002 in.

Additional time allowances are provided when the jig or fixture exceeds the above physical limits. For instance:

1. An allowance of 10% is made when "standard" size limits of the baseplate are exceeded. The additional time compensates for extra handling and drilling of the plate.

2. An allowance of 25% is added when the standard physical limits of the part are exceeded.

3. An allowance of 10% is necessary when a trunnion jig or fixture is needed. More time must be allotted for extra handling and assembly of the intricate fixture.

Baseplates or Mounting Plates Fall in Three Categories

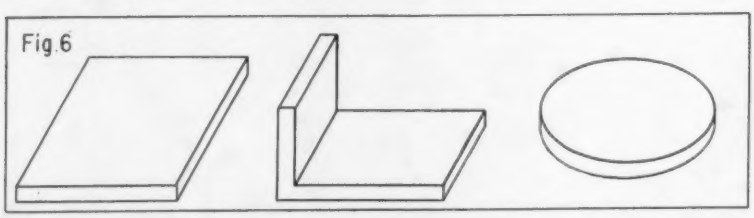


Fig. 6–Baseplates for drilling and milling fixtures are of various shapes

The selection of the proper mounting plate depends upon the "base" dimensions of the part, the general shape (rectangular, round, a combination of both, or tubing) and the type of machine to be used. The base dimensions of a part are the two linear bounds of the base of the part which locates itself on the mounting plate. Baseplates are customarily specified to be made of hot-rolled

or cold-rolled steel plates of various shapes to suit the job.

Each baseplate of the four general types is different in construction. The size of the baseplates will be classified into small, medium and large:

A *small* baseplate will house a part with dimensions up to and including 1 x 1 in.

A *medium* baseplate will hold a part with dimensions greater than 1 x 1 in. and up to and including 3 x 3 in.

A *large* baseplate will encompass a part with dimensions greater than 3 x 3 in. and up to and including 6 x 6 in.

The baseplate will be larger than the part in base dimension; usually from 1 to 3 in. is allowed on each side. This space is needed to assemble the nest or the fixture blocks.

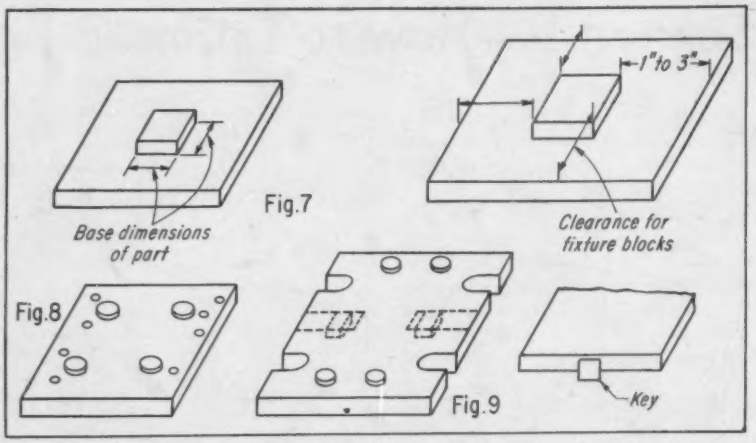


Fig. 7—In selecting a baseplate, two considerations are the linear bounds of the part (left) and clearance for fixture blocks (right). **Fig. 8—A baseplate** for a drilling fixture has four feet and rest buttons. **Fig. 9—Milling-fixture baseplates** require four rest buttons, two keyways and two keys

Table 9—Time Values for Flat Baseplates

Size	Thickness	Width	Length	Est. Hr.
		Drilling Fixtures		
Small	¾-1	3	3	6
Medium	¾-1	7	7	8
Large	¾-1	12	12	10
		Milling Fixtures		
Small	⅝-1⅛	3	6	10
Medium	⅝-1⅛	6	9	12
Large	⅝-1⅛	10	14	14
		Bench Fixtures		
Small	⅜-⅝	4	6	5
Medium		6	8	7
Large		9	12	9
		Faceplates		
Large		Machining purchased plate		6

Notes:

Time Values include:

1. For drilling, milling and bench fixtures—cutoff, squaring, grinding, layout, plus drilling, reaming and tapping for locators, clamps form blocks or vise grip as required, and assembly.

Additionally:

2. For drilling-fixture baseplates—making four feet for the baseplate and four rest buttons for the work.

3. For milling fixture baseplates—milling four bolt slots and two keyways, making and fitting two keys, and making four rest buttons.

4. For bench-fixture baseplates—making the vise grip.

Turning fixture—

Time values include (a) drilling, reaming and tapping the *purchased* faceplate for installation of locators, clamps, set blocks, (b) providing bolt holes to fasten faceplate to chuck, (c) milling slots for guiding clamps, and (d) assembly of faceplate to lathe chuck.

Baseplates for Bench Fixtures (Tube Bending)

Many bench fixtures are used for bending tubing. In order to determine the baseplate size of a bending fixture, the outline of the completed part is the key. The width and length of the bend are comparable to the base dimensions, as shown in Fig. 10.

A small baseplate will house a tubing part up to and including 1 in. wide by 4 in. long. A medium baseplate will house a tubing part up to and including 3 in. wide by 6 in. long. A large baseplate will house a tubing part up to and including 6 in. wide by 10 in. long.

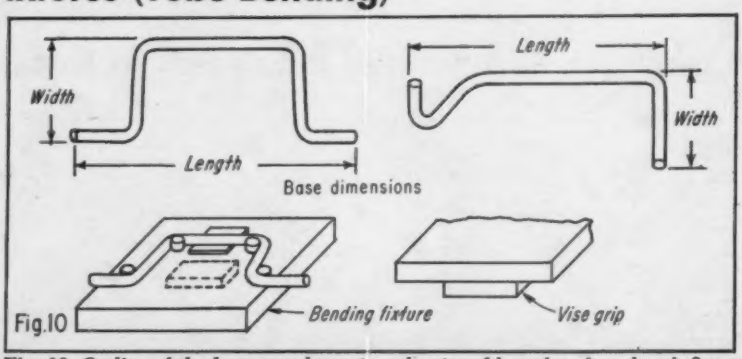


Fig. 10—Outline of the bent part determines the size of baseplate for a bench fixture

Angular Baseplates for Circumferential Operations

Angular baseplates are used in conjunction with a regular baseplate when the part is round and requires work done on its circumference. The shape of the part determines use of an angular baseplate in drilling, milling and turning fixtures.

Time values (Table 10) are based upon the use of the angle plate as a base or in combination with another baseplate. The C-shaped angle plate is also used in the making of a trunnion fixture. Time values include the complete machining of the angle plate along with the drilling, reaming and tapping for locators, clamps and set blocks.

Table 10—Time Values for Angular Baseplates

	Size	Angle as Base	In Combination	C Angle
		Hr	Hr	Hr
Small	3 x 3 x 3	10	5	7
Medium	6 x 6 x 6	15	9	11
Large	6 x 9 x 9	20	13	15

Time values include complete machining of the baseplate, plus drilling, reaming, and tapping for locators, clamps and set blocks

"In combination" refers to use of an angle plate with a flat baseplate.

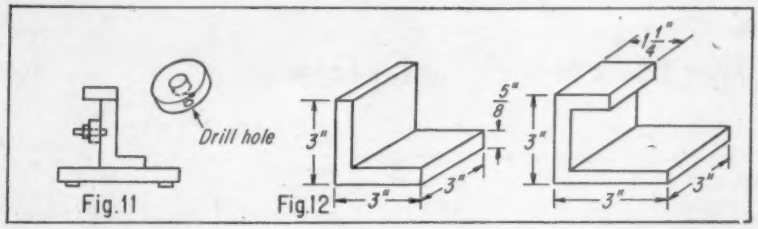


Fig.11 Fig.12

Fig. 11—Angular baseplates are mounted on flat baseplates to hold round parts requiring work on their circumference. **Fig. 12—Plain and C-shaped types,** are given time values for three sizes, Table 10

Special Baseplates for Two or More Operations

Baseplates discussed so far are used for one operation—in one plane. When two or more operations are required on a part, they are ordinarily done by two separate fixtures. With a special fixture, however, the two operations can be performed in the same fixture with minimum of movement on the part of the operator. Examples of such fixtures are:

1. **A box or tumble jig** is used for drilling opposed holes. The support legs are of such length that all holes of the same diameter can be drilled with the same spindle stop setting. Both holes can be drilled with only

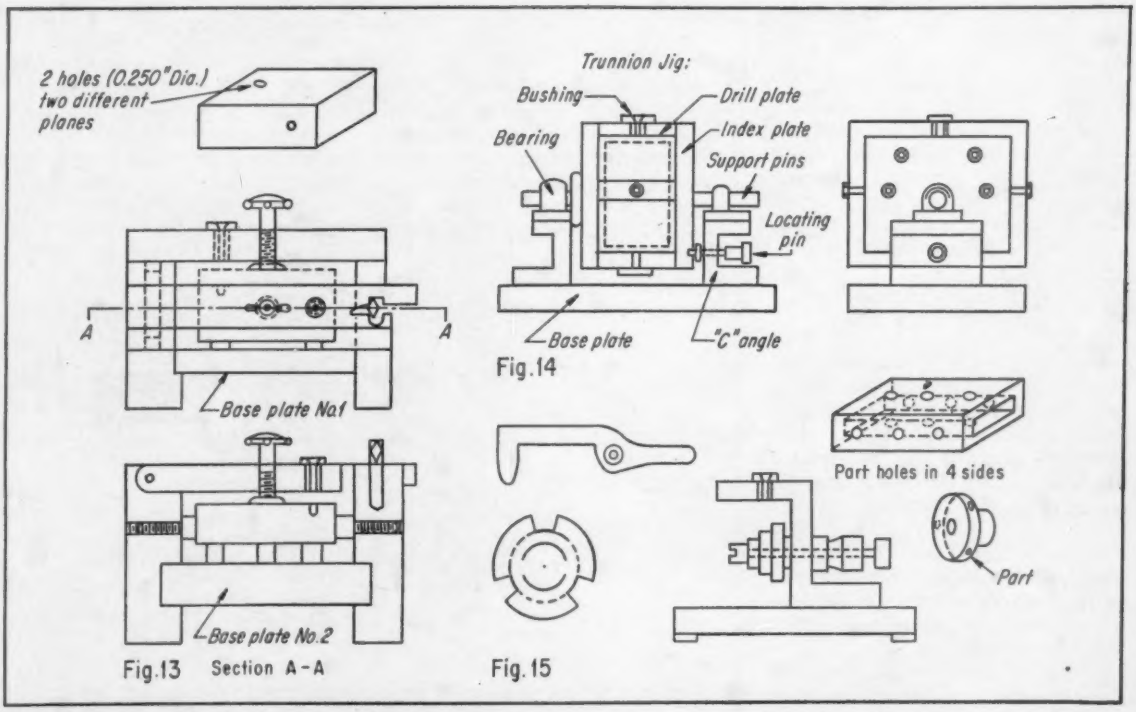


Fig. 13—Box or tumble jigs incorporate two baseplates

Fig. 14—Trunnion jigs are usually employed only for large parts

Fig. 15—Index drill jigs require 25 to 40 hr to make

one positioning for depth, which is made during setup. In a box jig, two baseplates are necessary. See Table 11 for time values.

2. **A trunnion-mounted jig or fixture** is used to drill opposed holes in two or more planes. The device is mounted between two pins and rotated by means of an index plate. The time to make the baseplate (12 in. wide x 18 in. long) is approximately 14 hr.

Trunnion jigs are usually associated with large parts. It doesn't pay to build this type of jig for small parts.

Table 11—Time Values for 2 Baseplates for Box Jigs

Size of Part	Base Thickness	Base Dimensions Width Length	Est. Hr.
Small	¾-1	3 x 3	11
Medium	¾-1	7 x 7	14
Large	¾-1	12 x12	17

3. **An index drill jig.** When the part to be drilled is round and more than one hole is to be drilled on the circumference, an index drill jig is used. The device is mounted on an angle plate and uses an index assembly to rotate the part. The index assembly consists of a lever, index hub, clamp and locating bar, clamp knob and washer.

The time value for the making of the index assembly will vary between 25 and 40 hr, depending upon the complexity of the assembly.

Five Locators for Baseplate Use

Every part has to be located on the baseplate to insure identical parts. A minimum of two-point location is necessary. There are many types of locators:

1. Pin
2. Block
3. Edge block
4. Nest
5. V-block

PIN LOCATORS — Parts with machined holes can use pin locators effectively—either straight pin or diamond pin. Small pin locators are up to ½ in. dia by 2 in. long; large pin locators, 1½ in. dia up to 2 in. long. Time values are given in Table 12.

BLOCK LOCATORS FOR TUBING—Block locators are used in bench fixtures, especially for bending. Time values include the cutoff, squaring, grinding, drilling and assembly of these blocks on the fixture.

	Est. Hr.
Small —	2.5
Medium —	3.5
Large —	4.5

EDGE BLOCKS AND NESTS—Edge and nest blocks are an effective means for locating a flat sheet metal part. Time values include the cutoff, squaring, grinding and assembling the blocks. The estimated time for one nest or edge is 2.5 hr.

V-BLOCK LOCATORS—These are an effective means of locating round parts. Time values include the cutoff, squaring, grinding and assembling the blocks.

	Est. Hr.
Small —	3.5
Medium —	4.5
Large —	5.5

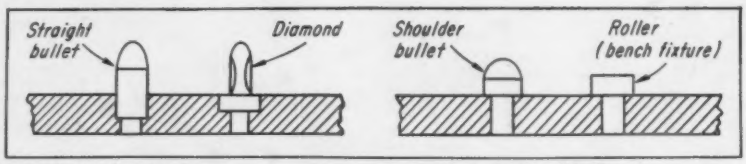


Fig. 16—Pin locators are used to position parts having machined holes

Table 12—Time Values for Pin Locators, Hr

Type	Machining	Jig boring	Assembly	Total
		Small—up to ½ x 2 in.		
Straight	0.25	1.00	0.50	1.75
Shoulder or roller	0.50	1.00	0.50	2.00
Diamond	0.50	1.00	0.50	2.00
		Large—½ to 1½ in. dia, to 2 in. long		
Straight	0.50	1.00	0.50	2.00
Shoulder or roller	0.75	1.00	0.50	2.25
Diamond	1.00	1.00	0.50	2.50

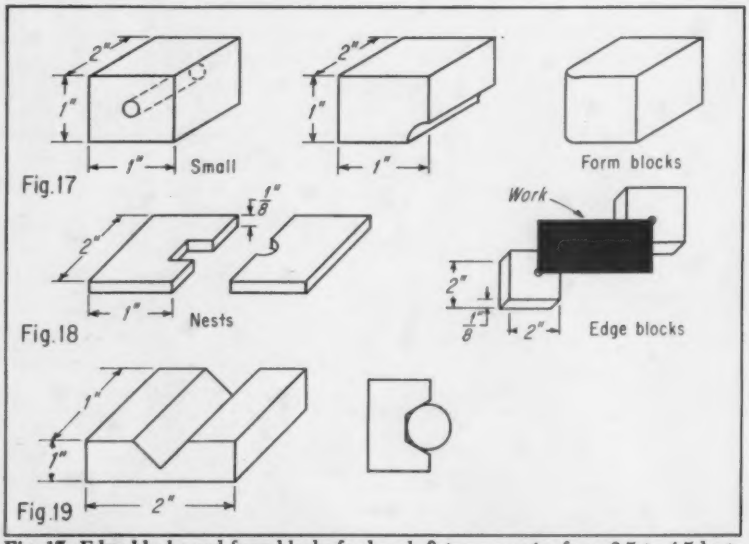


Fig. 17—Edge blocks and form blocks for bench fixtures require from 2.5 to 4.5 hr to make, depending on size. **Fig. 18**—Nests and edge blocks locate flat parts. **Fig. 19**—Round parts are customarily located in V-blocks

Positioners Include Support and Set Blocks

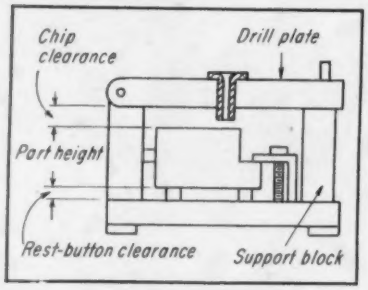


Fig. 20—Support blocks position workpieces in fixtures, and drill plates position and guide the tools

Table 13—Time Values for Drill Plates and Support Blocks

Part		Est. Hr.	2 Drill Plates for Box Jig	Index Plate Trunnion Jig
Small	⅝ x 3 x 3	3	5	
Medium	⅝ x 7 x 7	5	9	
Large	⅝ x 12 x 12	7	12	8

Support Blocks			
Height of part, In.			Est. Hr.
1	Small	⅝ x 1½ x 3	2
3	Medium	⅝ x 3½ x 7	3
5	Large	⅝ x 5½ x 12	4

Time values for drill plates and support blocks include cutoff, squaring, drilling and assembly on the fixture.

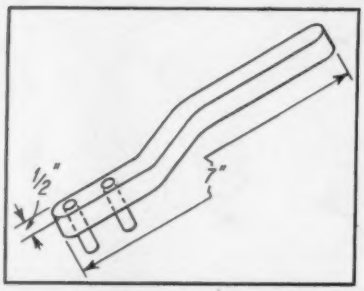


Fig. 21—Bending levers require 3 hr to make and assemble to the fixture

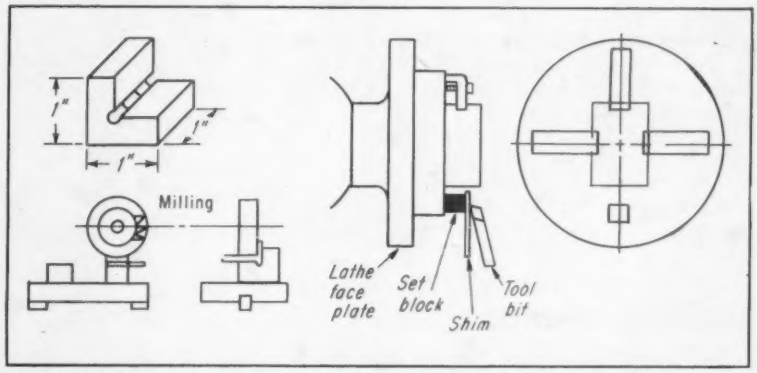


Fig. 22—Set blocks are used for positioning a milling cutter or a toolbit

DRILL PLATES—The size of the drill plate is roughly the size of the baseplate. The support block will be the width of the baseplate and the height will be approximately ½ in. more than the height of the part. The ½ in. space is necessary for chip clearance and room for the work to be supported on rest buttons. Therefore, the support-block dimension will depend upon the height of the part.

Index plates are similar to drill plates. They are used on trunnion jigs for large parts only.

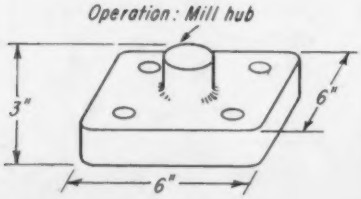
SET BLOCKS—In the making of a milling or turning fixture, a set block is employed for positioning the milling cutter or the toolbit. The time value for a set block is 2.5 hr.

BENDING LEVERS—In the making of a bending fixture, the most common type of bending lever (Fig. 21) requires 3 hr for cutoff, squaring, grinding, drilling, locating, bending and assembly. This device is shown as being 7-in. long.

Calculation for a Typical Fixture

Example—To estimate a milling fixture for a part with base dimensions of 6 x 6 in. This is a *large* part.

Estimate—Time values are listed for the various fixture elements that the estimator deems essential to hold the part shown.



Item	Reference	Est. Hr.
Baseplate	Table 9	14
Locators		
one shoulder	Table 12	2
one diamond	Table 12	2
Clamps	page 122	16
2 guided		
Positioners		
Set block	page 121	2.5
Jig bore & inspection	Table 16	5
		Total 41.5

Clamps Require Time Allowances

There are many types of clamps used in the making of jigs and fixtures. Time data are given for the four most common clamps.

1. Hand knob clamps
2. Strap clamps with heel
3. Strap clamps with special heel and pin for guiding on turning fixtures
4. Quick-acting milling clamps

Knobs and thumbscrews are stock items. See Table 14 for time allowances for drilling and assembly of fixture part.

For strap clamps with heel, time values include cutoff, squaring, slotting, grinding and assembly of the strap clamp and heel block:

Small — 3 hr.
Medium — 7 hr.
Large — 5 hr.

Guided strap clamps have a heel and pin for easy movement in the milled slots of milling or turning fixtures. Time values are:

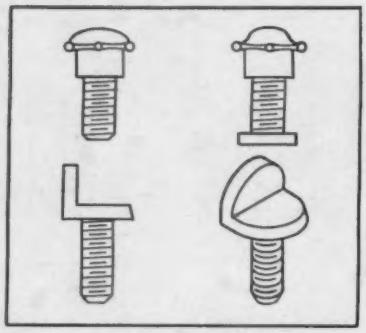
Small — 6 hr.
Medium — 7 hr.
Large — 8 hr.

Quick-acting milling clamps are purchased. Allow 1.0 hr for assembly.

Table 14—Time Values for Hand Knobs

Size of Part	Plain	With Block	Thumb Screw
Small	1.5	2.5	1.0
Medium	1.5	2.5	1.0
Large	1.5	2.5	1.0

Fig. 23—Time for drilling and assembly of fixture parts must be considered, when knobs and thumbscrews are used



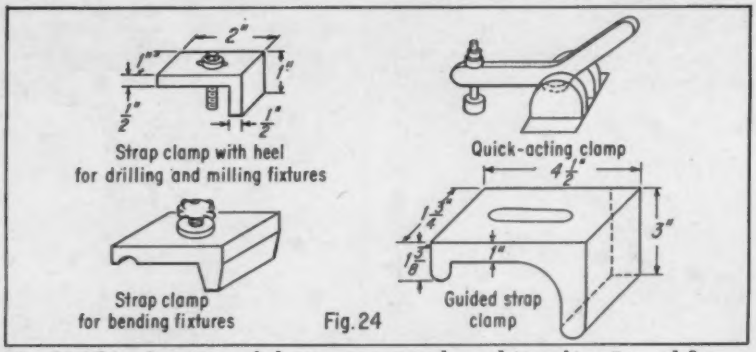


Fig. 24

Fig. 24—These four types of clamps are commonly used in making jigs and fixtures

Guide Bushings

Table 15—Time Values for Guide Bushings (OHTS)

Bushing Dia.	No. of holes	Shoulder type	Headless type	Jig boring & assembly
up to ⅝ in.	1	2	1.5	0.5 hr/hole
	2 to 4	1.5/bushing	1.0/bushing	
	5 or more	0.75/bushing	0.5/bushing	

Time values are assigned for jig boring the hole for each drill bushing. Separate time values are necessary for setup and layout on the jig boring machine. This value is influenced by the size of the part and the type of jig.

A drill plate is jig bored for press-fit shoulder bushings; an index plate is jig bored for headless bushings.

Jig Boring–Setup and Inspection

Additional time must be allowed for the setting up the jig or fixture on the jig-boring machine for boring the drill plate, index plate and the baseplate (for the accurate position of the locators). At the same time the jig borer inspects the relative parts of the fixture. The time allowance is greater for special jigs, box and trunnion, because of the complexity.

Table 16—Time Values for Jig-Borer Setup and Inspection

Part Size	Est. Hr.
Regular Fixtures	
Small	3
Medium	4
Large	5
Special Fixtures	
Box or tumble	6
Trunnion	8

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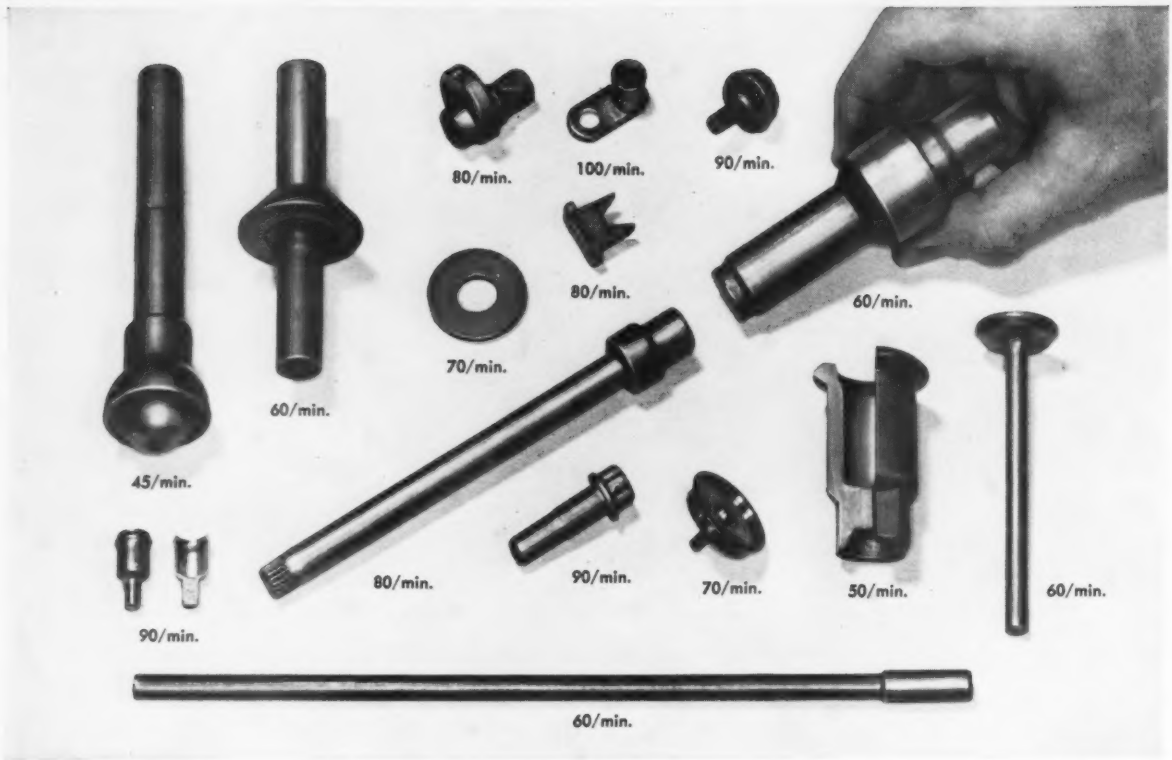

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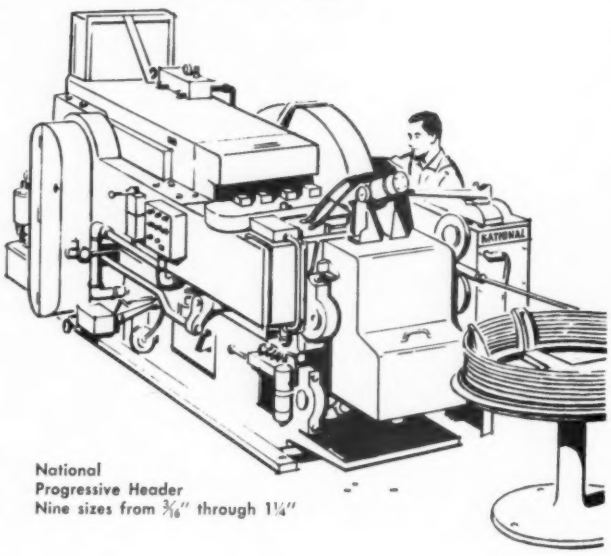

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REFERENCE BOOK SHEET

Plating of Precision Parts—I

By Robert D'Agostino,
staff mechanical engineer,
Central Development Engr. Dept,
Loral Electronics Corp,
Bronx 72, N Y

The control of plating deposits on precision-fitted parts has assumed special importance, because of the increasingly corrosive environments encountered in new military and industrial applications. As an aid to improved control, a method is presented for estimating the amount and location of plating deposits to assure proper assembly and performance of precision parts.

To determine machining dimensions and tolerances of a part before plating, parts which require a plating deposit may be grouped into four classes (Table 1). Details of these four classes are:

Class 1—Non-Critical parts have fractional and decimal dimensions and tolerances, in which no tolerance is ever less than ±0.005. In this case, dimensions and tolerances as they appear on the drawing may be used for machining the part. No allowances are necessary for plating. Consequently, the inspection department may accept parts having dimensions which exceed stipulated drawing tolerances by the amount of plating deposit.

Class 2—Marginal parts have decimal dimensions and tolerances in which one or more of the tolerances is less than ±0.005 in., but larger than ±0.0005 in. In this case a conventional tolerance analysis must be made if the surfaces having these tolerances are required to clear a mating part (i.e. a shaft loosely fitted in a hole). If no interference is indicated, the parts may be considered non-critical and treated like Class 1 parts. If an interference is indicated, "Before Plating" and "After Plating" dimensions and tolerances may be determined in accordance with the formulas listed in Table 2.

Class 3—Critical parts have decimal dimensions and tolerances in which one or more of the tolerances is less than ±0.0005 in. but larger than ±0.0002 in. In this case "Before Plating" and "After Plating" dimensions and tolerances may be determined in accordance with the formulas listed in Table 2. If any surface on the part is required to accomplish an interference fit with another part, it may be possible to use a knurl or annular ring as an alternate solution, as shown in Fig. 1. This solution will eliminate the need for exacting control during the machining and plating operations.

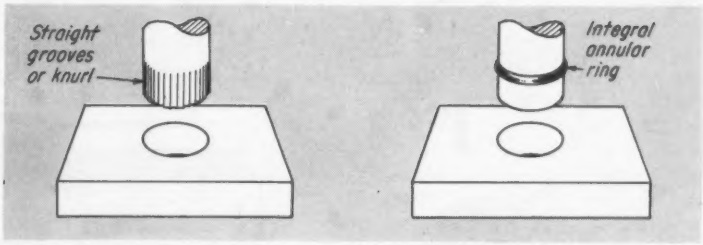

Fig. 1—Alternate solutions for obtaining interference fits on plated parts

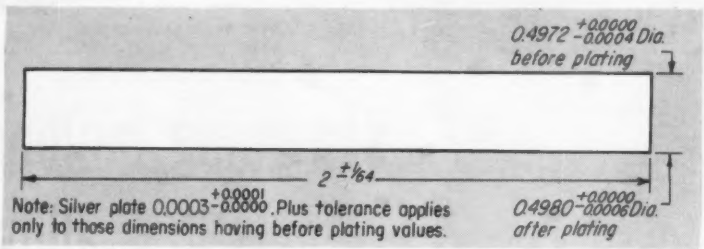
0.4972 +0.0000 −0.0004 Dia. before plating
2 ±1/64
Note: Silver plate 0.0003 +0.0001 −0.0000. Plus tolerance applies only to those dimensions having before plating values.
0.4980 +0.0000 −0.0006 Dia. after plating

Fig. 2—Sample drawing for precision part of Class 3

Table 1—Tolerances for Four Classes of Parts

Precision Class No.	Part Type	Dimensional Tolerance
1	Non-Critical	±0.005 min.
2	Marginal	±0.0005 to ±0.005
3	Critical	±0.0002 to ±0.0005
4	Super-Critical	±0.0002 max.

Class 4—Super critical parts have decimal dimensions and tolerances in which one or more of the tolerances is less than ±0.0002 in. This tolerance does not permit adequate allowances for both manufacturing and plating. Parts having such surfaces must, therefore, be manufactured and plated in one of four ways:

1. Those surfaces on the part that are super-critical may be masked to prevent plating. This practice of course increases costs.

2. The parts may be selectively chosen for assembly after plating. This of course will insure corrosion resistance but raise unit costs due to the need for individual handling and identification of parts.

3. Those surfaces on the part which are super-critical and circular in shape may be designed with the male portion having a knurl or annular ring, Fig. 1.

4. Those surfaces on the part which are super-critical may be plated and machined to final di-

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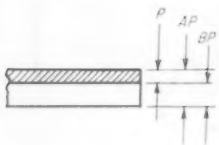
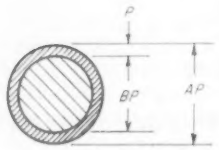
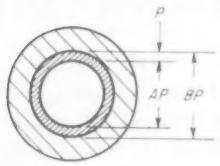
Plating of Precision Parts—II

mension and tolerance after plating. This approach reduces plating costs because the masking operation or close plating control is eliminated. However, machining costs will rise dependent upon the complexity of the part, its size and material. This technique is most effective where soft plating deposits are required, because hard deposits such as nickel or chrome tend to flake when machined and may peel off other areas.

Every time a Class 2, 3 or 4 part is used, costs rise proportionately. Therefore, every effort should be made to reduce the number of these classes on any part to a minimum. The need for Class 2, 3 or 4 parts should be carefully scrutinized, because these parts require special precautions and procedures by the plater, causes hardship in manufacturing and extra careful handling by the Quality Control Dept. Even when these classes must be used, effective savings are often realized by reducing Class 4 parts to Class 2 or 3 parts. •

Table 2—Formulas for Plating Allowances on Precision Parts

Type of Surface	Thickness of Plating Deposit P[1]				Machining Dimensions Before Plating[2]	
	Clearance Fit		Interference Ft		Clearance Fit	Interference Ft
	P_{Min}	P_{Max}	P_{Min}	P_{Max}		
 Single-plated (one side of flat surface)	Nom.	Nom. +0.0001	Nom.	Nom. +0.0001	$BP_{Min} = AP_{Min} - P_{Min}$ $BP_{Max} = AP_{Max} - P_{Max}$	$BP_{Min} = AP_{Min} - P_{Min}$ $BP_{Max} = AP_{Max} - P_{Max}$
 Double-plated external (shaft)	Nom.	Nom. +0.0001	Nom.	Do not specify Max.	$BP_{Min} = AP_{Min} - 2P_{Min}$ $BP_{Max} = AP_{Max} - 2P_{Max}$	BP_{Min} = P.F.D. BP_{Max} = P.F.D. +0.0005
 Double-plated internal (hole)	Nom.	Nom. +0.0002	Nom.	Do not specify Max.	$BP_{Min} = AP_{Min} + 2P_{Max}$ $BP_{Max} = AP_{Max} + 2P_{Min}$	BP_{Min} = P.F.D. BP_{Max} = P.F.D. +0.0005

Nomenclature

AP_{Min}—After-plating minimum dimension
AP_{Max}—After-plating maximum dimension
BP_{Min}—Before-plating minimum dimension
PFD—Nominal press-fit diameter
P_{Min}—Minimum plating deposit
P_{Max}—Maximum plating deposit

Notes:

1. The minimum and maximum values of plating deposit indicate tolerances that can usually be held by the plater on significant surfaces (i.e. surfaces which can be touched by a ¾ in. spherical ball).

2. The values for "After Plating" are the functional values which have been calculated by the designer, based on initial design requirements. They indicate performance of the part.

EXAMPLE: A shaft must have a final after-plating diameter of 0.4980 in. +0.0000, —0.0006 to fit the mating part with clearance. Find the "Before Plating" (machining) dimension and tolerance if the plating is to be 0.0003 minimum thickness of silver.

Step 1: This part falls into Class 3 (less than ±0.0005 in. but more than ±0.0002 in.).

In Table 2 for a double-plated external surface it can be seen that the maximum plating thickness (P_{Max}) can be controlled within 0.0001 in. Therefore P_{Max} = 0.0004 in.

Step 2: In Table 2 for a double-plated external surface, the formulas for a clearance fit are:

(a) $BP_{Min} = AP_{Min} - 2P_{Min}$
(b) $BP_{Max} = AP_{Max} - 2P_{Max}$

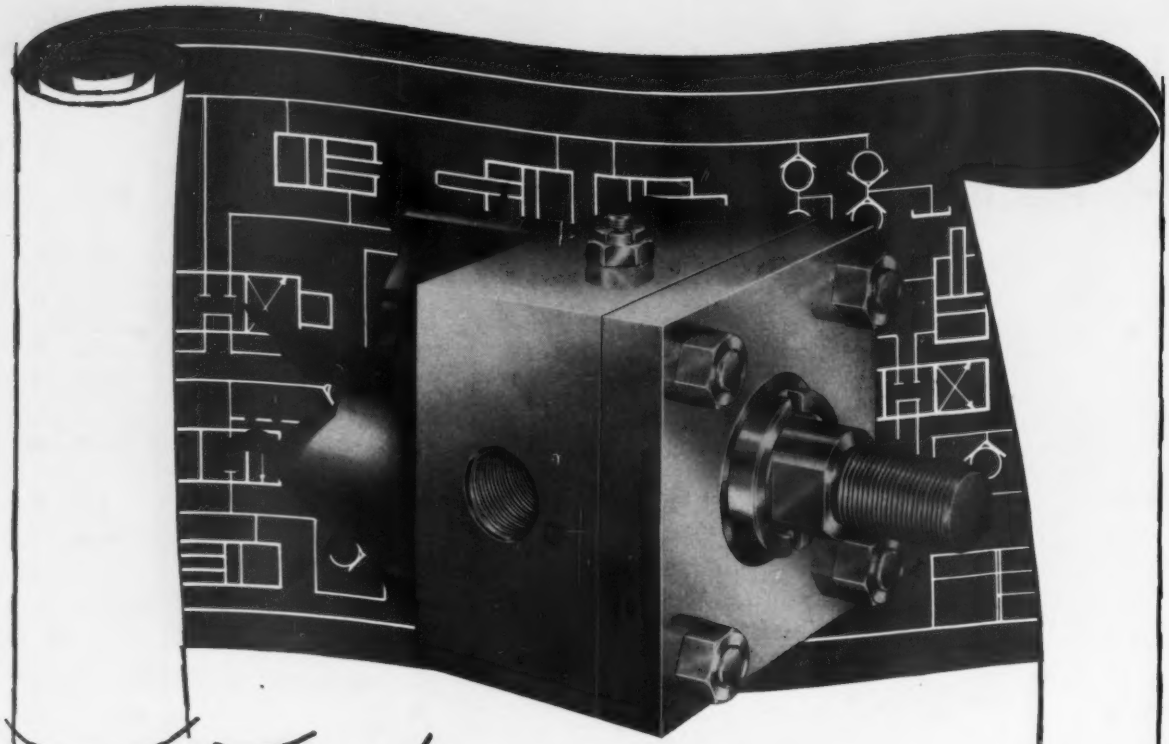
Substituting in (a):

$BP_{Min} = 0.4974 - 2(0.0003)$
$= 0.4966$

Substituting in (b):

$BP_{Max} = 0.4980 - 2(0.0004)$
$= 0.4972$

Therefore: "Before Plating" dimension of 0.4972 in. +0.000, —0.0004 is written on detail drawing of part as well as the "After Plating" dimension of 0.4980 in., +0.0000, —0.0006. See Fig. 2.



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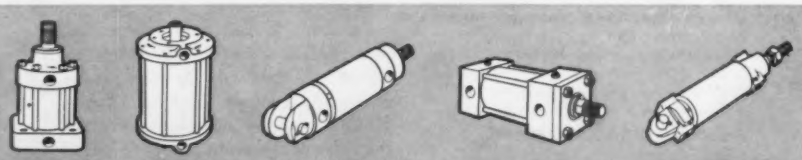

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Title Trouble

TITLES ARE MUCH respected in Germany and this has led to some difficulty with "Ingenieur" which has no limitations. Anyone can put this title after his name—a fact unknown to most Germans.

Thus a garage owner advertising himself as "Kraftfahrzeugmeister" (automechanic master — a legally protected title) has lost customers to another garage owner calling himself "Ingenieur."

Graduates of technical universities receive the title "Diplom Ingenieur" which is roughly equivalent to a master's degree from a topnotch US college. This is legally protected. But the bulk of German engineers graduate from non-university engineering schools that have shorter, more specialized courses. Graduates have the title "Ingenieur," but the title is also given by non-accredited schools and by industrial firms, and taken by people who simply assume the title without formal training.

Now 23 German organizations are lobbying for a law to protect the title. Meantime, the only safe means of distinction is membership in one of the major engineering associations.

It all sounds a bit different from America where an engineer with a Doctor's degree is likely to answer to the name of Tex and be embarrassed if you call him "Doctor." Or it is until you remember the efforts to establish state registration boards and the movements to raise the status of the word "engineer."

Longer History

ZINJANTHROPUS, the flatheaded creature found as a fossil in Tanganyika a couple of years ago had originally been dated as more than 600,000 years old. Now we hear that the date, by radioactive tests, has been moved back more than a million years to 1,750,000 years ago. Since Mr Z is the earliest known toolmaker this makes the use of tools even more well-established than we had suspected. We didn't develop those first machetes into numerically controlled contour mills quite as fast as we had thought.

Selling Tool Steel

BRAEBURN ALLOY reports that during a field test of their new tool steel, Braecut, a customer took an extra heavy cut to really test the toughness of a Braecut bit. The bit took the cut all right but the customer's lathe broke. Wonder what kind of an order they got from him?

Quick Rig

TWO RUBBER-WHEELED dollies turned bottom up make a dandy rig for welding and assembly of a large steel tank. That was the discovery of F S Ring, experimental engineering, at Lockheed-Georgia.

Letter to Detroit

JUST RETURNED from a long and pleasant cross-country vacation by car, we have a tip to pass to you and to the people who build cars. Mechanically our vehicle behaved perfectly but we would have gone blind from the reflection of the sun off the top of the instrument panel if we hadn't covered the offending surface with dark blue cloth just before we left. We held the cloth in place with rubber cement. It looks silly, but it works, and it is not nearly as silly as the designer who angled the surface in such a way that the sun otherwise manages to reflect directly in our eyes about 40% of the time. We're sure this wasn't easy, but he managed to do it.

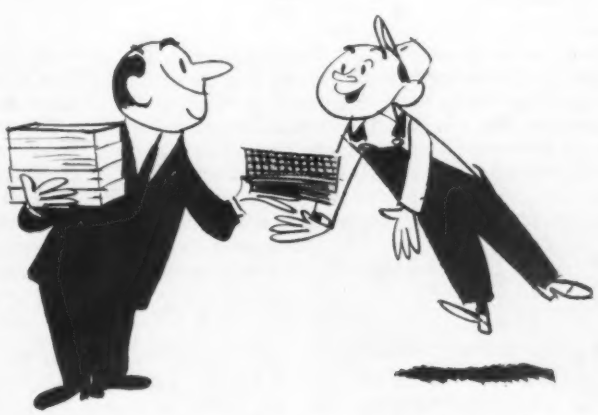
Extrusion Press

A SCHLOEMANN hydraulic extrusion press is being built in the US. The 2200-ton unit, which will handle billets of 10-in. dia was designed by Feller Engineering Co in Pittsburgh and is being built by the Neville Island shops of Dravo Corp. The press will include a turret-head die shifter.

Green Stamps, Too!

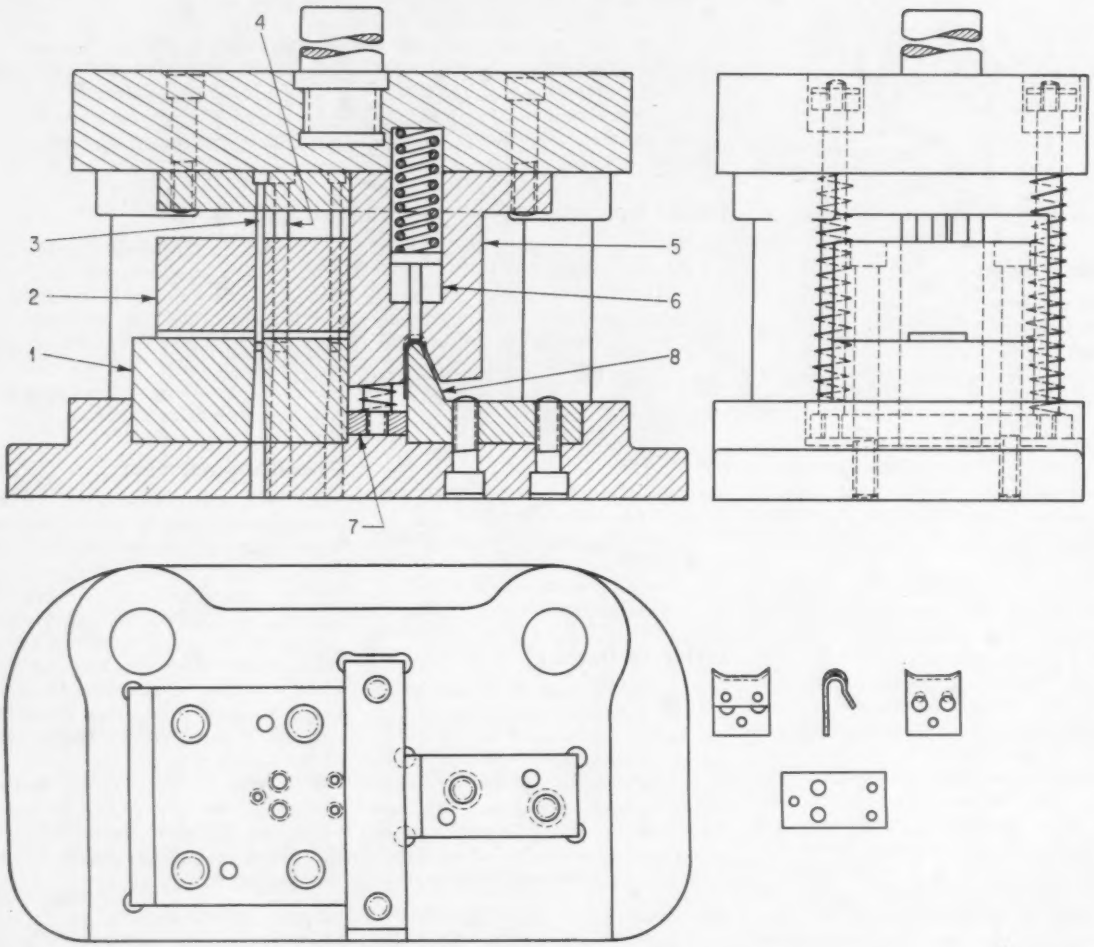
WE HAVE LONG associated Green Stamps with grocery stores and we were mildly surprised when our gas station started giving them recently. But the big surprise came when we heard that AMF's J B Beaird division gave employees a million and a half Green Stamps in their pay envelopes during a three-month campaign to raise production efficiency and boost sales. A top prize was 25,000 Green Stamps.

According to John Tullis, Beaird president, the stamps mean much more than the same amount of cash. But think of pasting 25,000 stamps into books! •



Practical Ideas

Progressive Die Forms Complex Clips



This high-speed progressive die is designed to produce at the rate of 8000 to 9000 pieces per hr. The material is brass strip, 0.0354 in. thick and 0.7874 in. wide, and is fed automatically from a coil. Stock enters from the left into an inverted-channel stripper 2 which is made slightly shorter than the die 1 to help in inserting it. The three smaller holes are pierced by the punches 3, and the two larger ones by punches 4, in the first stage of the operation. The stock is then advanced by the feed mechanism, cut off between the die 1 and the edge of the forming punch 5, and gripped by the forming die. The hairpin bend, the angular bend, and the saddle form are formed by the punch 5.

The stripper 6 ejects the work from the forming punch, and stripper 7, which is carried by the upper die shoe, strips it from the forming die 8. An air jet blows it clear. The stripper 7 is an important feature of the die and is carried on two screws, around which are springs which hold it in the down position.

Hjalmar Dahl, Upplands Vasby, Sweden

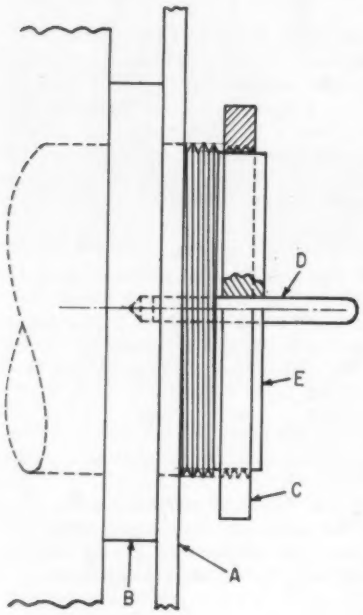
Welding Torch Frees Fittings

In overhauling engines we used to have a lot of trouble removing the shrink-fitted valve inserts without damaging the block. Now we just run a weld bead around one end of the insert, and the resultant shrinkage allows us to pull the insert free.

Similarly with valve seats, we run a bead around the bevel and, as the weld metal cools it pulls in on the seat and frees it. In both cases, care must be taken not to weld the inserts to the body of the block.

S Clark, E Bradenton, Fla

Guide Stops Cross Threading



Starting a nut onto a large-diameter, fine-threaded part can be very troublesome because of the tendency to cross the first threads. We ran into this condition on some new machines on which an index plate *A* is mounted on the shaft *B* and locked against the flange by the spanner nut *C*. The index plates have to be removed frequently and replaced by others, and operators were losing time and running into trouble in getting the nut started straight.

There were not enough threads to allow us to machine a pilot on the end of the shaft, and we could not attach a pilot because a moving part of the machine passes close to the shaft end. We found the solution in a false pilot *E*, which is just a steel disc turned to a diameter slightly smaller than the root diameter of the thread. A pin *D* is pressed into the center of the disc and enters a hole drilled in the end of the shaft. To replace the nut, we insert the pin into the hole and bring the face of the disc up against the shaft end. Then we slip the nut over the disc, which holds it in position for correct starting. When the thread is well started, we remove the disc and pin.

L Kasper, Philadelphia, Pa

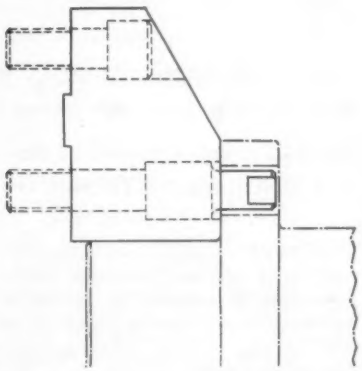
Pin Improves Lathe Safety

When doing second-operation work on a turret lathe, using soft chuck jaws, there is always a danger of the work slipping because serrated jaws or tight clamping cannot usually be tolerated. Slipping can not only break the tool, but may also damage the machine because it may occur when the operator is tending another machine.

If the part has an integral flange in which holes are, or will be drilled, the danger can be avoided by making a special jaw-retaining screw with a pin projecting from the head. This pin is turned to suit the diameter of the flange holes, and has two flats so the screw can be tightened with a wrench. The screw thus serves the dual purpose of holding the jaw to the chuck and acting as a work driver.

It may be necessary to change the operation sequence to schedule the flange drilling before the second lathe operation, but the little trouble involved is more than made up by the increased safety and reduction in scrapped work due to slipping.

Roger Isetts, Kenosha, Wis

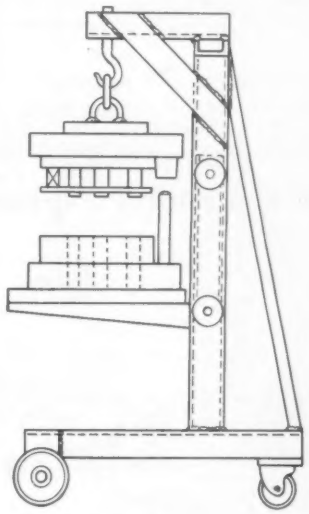


Hook Improves Die-Lift Truck

We greatly improved the usefulness of our die-lift truck by welding a piece of heavy channel to the top of the column and bracing it with two diagonals. A hook was welded to this overarm so that it was in line with the center of the table. Then we made up a heavy steel plate long enough to cover our biggest shoe, and welded a U-shaped handle to the middle of it. Before welding, we slipped a single link of heavy chain over the handle.

To use the setup we set the die on the table and clamp the top shoe to the plate with C-clamps. Then we raise the whole thing up until we can hook the chain link into the top hook. Then we lower the table and so separate the two halves of the die. It has saved us a lot of back-breaking work and eliminated the danger of injured feet and hands.

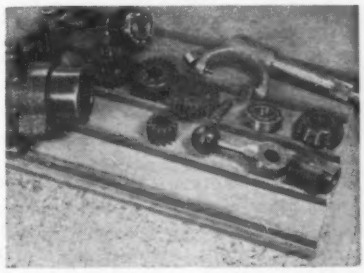
Frank A Nelis, Dania, Fla



Bench Board Holds Parts

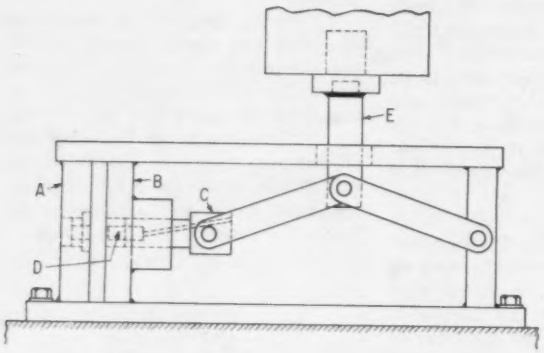
This simple bench board helps to keep parts in their correct relative positions when disassembling a machine part. It also serves to keep them from rolling off the bench. It is just a piece of plywood or other material to which some strips of old V-belt have been nailed. It can be made in any desired length and with any number of partitions.

H J Gerber, Stillwater, Okla



Practical Ideas

Toggle Increases Press Capacity

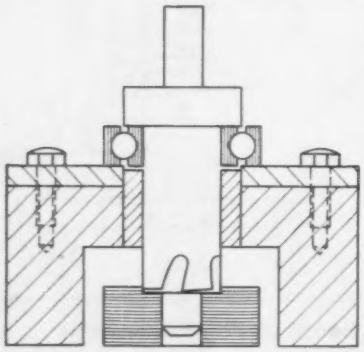


We recently had to do a job which required punching long rows of ⅝-in. holes in flat barstock ½ in. thick and 5 in. wide. Our press did not have sufficient capacity to handle the work, so we built this toggle-type multiplier of welded steel plate. The vertical member *A* is bored to accept a shouldered die bushing, and member *B* carries a boss to support the punch holder *C*. The punch holder has a square head and a round body and is bored to receive the punch *D*. A hole is drilled through the holder to permit the punch to be knocked out. The plunger *E* is a piece of square stock set into a holder turned to fit the press ram and pinned to the two pairs of toggle links. The pin at *C* must be removable to permit pulling the punch for sharpening.

To use the device, the stock is passed between the uprights *A* and *B* and is positioned for successive holes by a pin (not shown) that goes through *A* and into the previously punched hole.

H Koslow, Bronx, NY

Ball Bearing Acts as Co'Bore Stop



In order to hold the depth of counterbores within 0.001 in. we fitted a ball bearing to the shank of the counterboring tool. This acts as a positive stop and allows the spindle to continue rotating after the required depth has been reached.

The fixture we used was a simple U-shaped member, but this can be varied to suit the particular job in hand. It carries an Oilite bushing to guide the tool, and a hardened wear plate on top. The shank of the counterbore is ground to a press fit for a standard ball bearing and has a shoulder against which the latter bears. A pilot is provided to ensure concentricity.

After assembly, the top of the wear plate is surface ground to obtain the exact distance between it and the bottom of the counterbore. This is also done each time the counterbore is sharpened.

In use, the ball bearing runs free until the outer race comes into contact with the wear plate and stops downward movement. It then remains stationary while the inner race rotates, thus preventing wear on the wear plate.

Robert E Kiehl, Sheboygan, Wis

Maybe you think you're no author,
And maybe can't draw worth a hoot,
But don't let that stand in your way, sir,
If you've got an idea—then shoot.

We've editors, artists, and draftsmen,
Who'll do all that's needed to show
The reader the way that it functions,
And You'll be collecting the dough.

JAW EXTENSIONS SUPPORT WORK OVERHANG
Was the winning entry in the June 12, 1961 issue

The $25 prize is awarded to:
A A SINISI, Mount Vernon, NY

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning idea is made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors, without reservations or bias, as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc., and those of its advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

Names in the News

General Electric Co, Schenectady, NY, has elected **Gerald L Phillippe** (left) president and **Cramer W LaPierre** executive vice president. Mr Phillippe has been controller and principal financial officer of the company since 1953. Mr LaPierre formerly was vice president and group executive in charge of the Electronic and Flight Systems Group. **Ralph J Cordiner,** chairman of the board and chief executive officer, has been acting in the dual capacity of chairman and president since early this year

Chrysler Corp has named **Hayward F York** manager of manufacturing engineering. He was formerly chief production engineer

Indiana Forge & Machine Co, East Chicago, Ind, producer of drop forgings, has elected **E J Carlson Jr** president of the company. Formerly vice president, sales, he succeeds his father **E J Carlson,** founder, and president of the company for 33 years, who will now serve as board chairman.

Lansing Stamping Co, Lansing, Mich, has elected **Stanley N Johnson** executive vice president. He was formerly executive vice president of the Automotive Division of Motor Wheel Corp.

Willys Motors Inc, Toledo, has elected **James Beattie Jr** vice president and general sales manager. He has been general sales manager since January 1960.

Douglas Aircraft Co, Santa Monica, Calif, has named **Elmer P Wheaton** acting vice president, engineering. He takes over the duties of Vice President **Edward F Burton** who has been granted extended leave because of illness. Mr Wheaton has been serving as vice president, technical, under Mr Burton.

G M Diehl Machine Works, Wabash, Ind, maker of saws and cutter grinders, has appointed **Charles W Tuttle** president to succeed **John A Collinge** who has resigned as president of both Diehl and Indiana-MacKay Foundry Corp, Muncie, Ind. Mr Tuttle has been executive vice president of Diehl and was previously vice president and general manager of Indiana-MacKay.

(Continued on page 194)

Gleason Works, Rochester, NY, manufacturer of precision gear machinery, has appointed **Bernard J Mezger** manager of technical coordination. He was formerly a research and development manager with Radio Corp of America

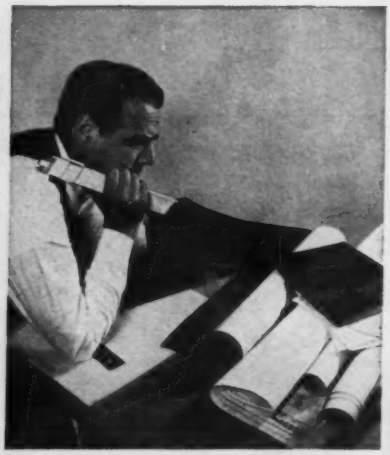
Doehler-Jarvis Division of National Lead Co, Toledo producer of die castings, has appointed **Alfred F Bauer** manager. He has been serving as assistant general manager since 1956

Sunbeam Equipment Corp, Meadville, Pa, manufacturer of industrial furnaces, has appointed **John P Zur** vice president, engineering. He was formerly chief engineer of the company

Wesson Corp, Ferndale, Mich, producer of carbide tools and metals, has appointed **Robert W Berry Jr** chief engineer. He has been serving as chief research development engineer

NEW TOOL STEEL SERVICE

helps you estimate costs more accurately!



Estimating tooling costs, especially on new jobs,

becomes more accurate and profitable with Crucible's new Tool Steel Service.

This service enables you to use fewer grades of tool steels...

which you get to know inside-out! So, you can more accurately predict

machining and bench time, and response to heat treating.

And because you're completely familiar with all the basic grades you use...

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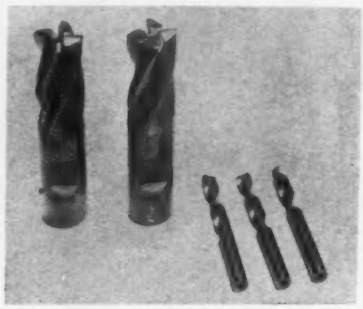
CRUCIBLE STEEL OF CANADA, LTD., SOREL, QUEBEC, CANADA

Chromalloy Cutting Carbide Composition Machines Easily, Heat Hardens to Rh70C

Ferro-Tic J is a cutting grade carbide that can be turned, drilled, milled, tapped or filed in its annealed state. Once heat treated up to Rh 70 C, the tool blank material behaves like a solid carbide.

The tool material is a sintered composite of carbide particles dispersed in a high-speed steel matrix. This allows the easily shaped material to retain a cutting life that reportedly compares favorably with that of conventional carbides, which must be shaped with diamond grinding.

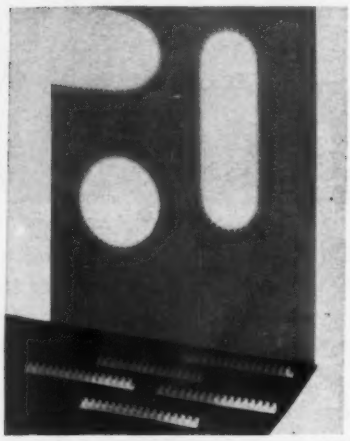
Ferro-Tic J can be used to cut ferrous alloys, as well as a wide range of non-ferrous and non-metallic materials, and cutting speeds of 100 to 200 sfpm on semi-hard alloys are said possible without damaging the tool.



The life of tools made with the new material is said to be up to ten times that of high-speed steels.

Sintercast Division, Chromalloy Corp, 171 Western Highway, West Nyack, NY

MORE DATA? Circle 90, inside back cover

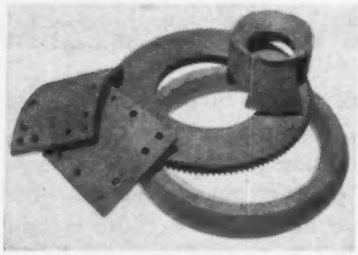


Nylon Grommets Can be Cut To Fit Any Shape Hole

The Pipcat nylon grommet used for insulating holes of over 3 in. in diameter will fit any shape hole without special tooling. With three sizes of grommet available from stock, grommets can be supplied to fit 10 gage to 24 gage steel or aluminum sheets. Standard length of the grommet is 10 in. so that fitting the grommet to a hole requires only cutting to size. For smaller holes, tension of the grommet will hold it in place but for round or square holes over 6 in. in dia, solvents may be needed to hold the grommets to metal.

Plastiglide Mfg Corp, 1757 Stanford St, Santa Monica, Calif

MORE DATA? Circle 91, inside back cover



Johns-Manville Brake Material Resists Fading at 1000 F

New organic friction material is said to almost completely eliminate fading under high temperature conditions. Called J-M Style 160, it gives positive control of brakes and clutches at temperatures up to 1000 F.

Average coefficient of friction is 0.56 at 350 F, 0.62 at 600 F, and 0.53 at 1000 F. The rigid molded material is manufactured in blocks, facings and sheets.

Johns-Manville, 22 E 40 St, New York 16, NY

MORE DATA? Circle 92, inside back cover

Westinghouse Introduces Two New Grades of Micarta Tubing

Two new grades of postformable Micarta tubing can be softened by heating for five minutes at a temperature of 135 to 150 C. After the tubing is softened it can be given a permanent configuration. The two grades are HY-371 (cloth based) and HY-370 (paper based). Compressive strength is 18,500 psi for the paper based grade and 23,300 psi for the cloth based grade. Water absorption is 2.1 and 0.8 percent respectively, and short-time dielectric strength is 700 and 341 volts per mil. Internal diameters range from ⅛ through 1 in., wall thicknesses from 1/32 through 3/16 in., and maximum length is 46 in.

Micarta Div, Westinghouse Electric Corp, Hampton, SC

MORE DATA? Circle 93, inside back cover

Marking Ink Dries in Seconds On All Non-Porous Surfaces

An 11-Mark ink will print identification, code numbers, and production numbers on all non-porous surfaces, such as plastics, glass, metal, rubber and cellophane. The ink dries in a few seconds and can therefore be used on a production line. Offered in black and five colors—blue, green, red, orange, and yellow—the ink is used with a stencil-cut hand printer which has a reservoir containing enough ink for several thousand prints before refilling.

Weber Marking Systems, Inc, Weber Industrial Park, Mount Prospect, Ill

MORE DATA? Circle 94, inside back cover

Solution Descales, Brightens Stainless With Single Dip

Immersion bright dipping and descaling of stainless can be done with a single solution designated No. 205 stainless descaling solution. The solution, which contains no hydrofluoric acid, works without current to remove welding and heat treating scale and at the same time to give a bright finish to stainless.

Fidelity Chemical Products Corp, 470 Frelinghuysen Ave, Newark 12, NJ

MORE DATA? Circle 95, inside back cover

Milwaukee shop finds way to form products for 76 industries on single machine!

Here at Biersach and Niedermeyer, Milwaukee, U-channels are being formed at 400 per hour from 18 gauge steel. Tomorrow, on the same machine, they may be forming W-shaped fins from 24 gauge steel; or cylindrical motor housings holding close tolerances on roundness and end alignment; or any of hundreds of other products. Production runs are generally limited and, with this versatile press brake, Biersach and Niedermeyer has eliminated the need for expensive specialized machinery to produce the huge variety of products required by 76 separate industries. They quickly and easily set up the Pacific press brake to do virtually any job. Adjusting the stroke length by a six station micrometer depth stop, they form several different bends accurately from one die set. Any shop, large or small, can reduce machinery and operational costs with a versatile Pacific hydraulic press brake. Write for brochure.

PACIFIC HYDRAULIC PRESSES AND SHEARS

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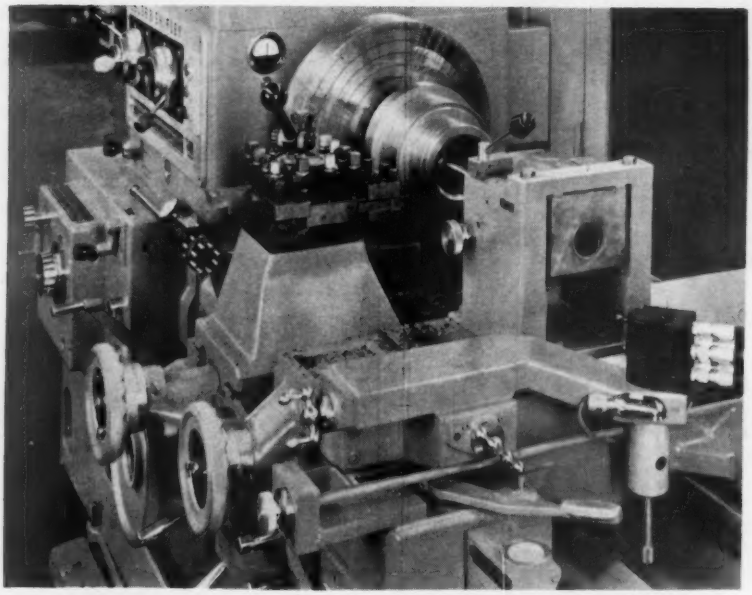
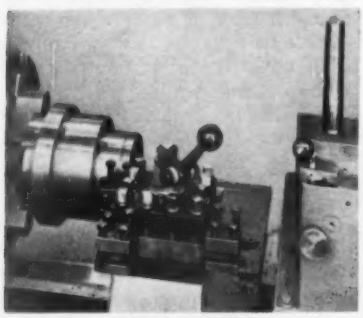


Lodge & Shipley Adds Pivoting Slide To Engine Lathe for Contour Boring

Called the Dual Slide Boring lathe, this standard 2516 engine lathe has a special carriage equipped with two cross slides. The left-hand turning slide is conventional in all respects (except it has no swivel and top slide); the right-hand boring slide is tracer controlled and has a vertically pivoted boring bar holder.

Because it has this swing-up type boring bar holder, the lathe is capable of fully indexing the four-way tool block down to the center line of the machine without interference from the boring bar.



Pivoting boring bar holder can be raised up (as at right) to allow full indexing of the four-way tool block down to the centerline, without interference

Dual slide arrangement

With the two slides mounted like this on a common carriage, accurate and/or contour boring work can be accomplished after the OD has been finish turned—all in one chucking. Also, internal and external threads can be turned in one chucking.

The tracer slide (for the boring slide) has compound slides to allow axial and transverse adjustments of the stylus independently of the tool. Also, the boring tool slide is furnished with a pivoting boring bar holder and can be adjusted 3½ in. perpendicular to the spindle center line independently of the tracer head.

The tracer and boring tool slides move as a unit when tracing, because they are connected to the rear-mounted hydraulic cylinder—which has a 5-in. stroke—by a common crossfeed screw.

An interesting feature of the tracing system is the fluid motor drive at the head end of the machine. Modulated feed provides (through stylus deflection) a variable feed rate to the carriage. This assures uniform tool feed over all contours of the workpiece.

Saves setup time

The workpiece shown in cuts is a good example of the type work that is suited to the Dual Slide. Previously, this part required two separate operations: The OD was first machined in a standard engine lathe and then was moved to another lathe where the ID was contour bored with a hydraulic tracer and special boring bar mounted on the lathe compound.

Because of the time required to change from a four-way tool block to the boring bar arrangement and then back again on each successive piece, it was impractical to do the complete job on the tracer lathe.

The manufacturing process is now much simpler with the Dual Slide. After turning the chuck end, the part is rechucked, rough turned, rough bored, finish turned, and finish bored —all in the same setting. Results: Workpiece is held to closer tolerances; reduced setup and handling time saves in labor and overhead.

Standard equipment with the machine includes: rapid travese to left-hand turning slide and carriage, 7-in. square McCrosky tool block, bed-mounted templet support bar, tracer stylus light, horsepower meter. All standard 55 feeds and threads are furnished as standard with additional ranges available through the fluid motor drive when tracing.

Accessories available

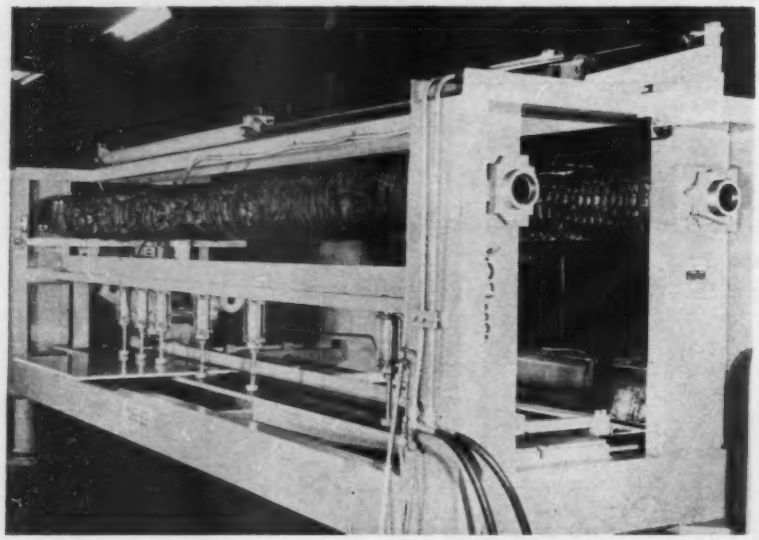
The lathe comes in three spindle speed ranges and can be furnished with a maximum of 30 hp. Spindle nose can be L2 or 8-in. D1, with specials available at extra cost. Other specifications and dimensions are comparable to those of the 2516 standard machine.

Optional equipment includes: treadle operated, heavy duty spindle brake; automatic kick-off when traversing toward tail end; Acra-Stop carriage length stop.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio

MORE DATA? Circle 51, inside back cover

NEW SHOP EQUIPMENT



Wallace Plate Cutting Machine Gives 60 To 100 Micro inch Finish on Aluminum

Designed to cut both ferrous and non-ferrous metals, this new plate cutting machine produces a finish of 60 to 100 micro-in. on aluminum and under 125 micro-in. on steel.

The machine's 20-in. carbide-tipped wheel is locked for cutting non-ferrous metal and oscillates for ferrous metal cutting. Changeover from ferrous to non-ferrous cutting can be made in under five minutes.

Cutting rates for non-ferrous metal are as follows: Aluminum plate 1 in. thick by 12 ft. long is cut in under one minute, and 4 in. thick aluminum plate is cut at a rate of 4 fpm.

For ferrous metals, cuts are made at the rate of 3 seconds per square in. This means that a 10-ft. long by 1-in. thick steel plate is cut in 6 minutes.

These capacities are for the smaller 15-hp unit (shown). A larger machine with 25 hp and a 26-in. wheel has a capacity of 4 in. steel or 6 in. aluminum plate up to 12 ft wide.

On both machines, cuts have 2 perfectly square straight edges and result in no change in the metallurgical quality of the plate, according to the manufacturer.

A mist coolant system built into the machine feeds mist onto the carbide cutting wheel automatically through the wheel guard when cutting non-ferrous metal.

Price of the machines are $13,000 for the smaller machine and $15,000 for the larger unit.

Wallace Supplies Mfg Co, Chicago 14, Ill

MORE DATA? Circle 52, inside back cover

Toolpost Grinder Uses Same Quill For Internal, External Grinding

Design of Model T-P completely eliminates the need for electric motors, belts, and pulleys. Complete visibility during all grinding operations is assured because the unit is operated by a 1-hp air motor enclosed inside the quill. This motor has top speed of 18,000 rpm and operates through 4:1 reduction gears to produce a max spindle speed of 4500 rpm. Grinding speed can be changed by adjusting the air supply valve. Complete motor and quill assembly is only 1⅞ in. in diameter so that full visibility of work is maintained even during internal grinding.

Quill assembly is mounted on the lathe compound by means of a support block which includes an eccentric. The eccentric provides a ⅞-in. vertical adjustment of the quill which simplifies moving the grinder to lathes of varying sizes.

Gilmore Industrial Grinders Inc, 6523 Eppes St, Houston 17, Texas

MORE DATA? Circle 53, inside back cover

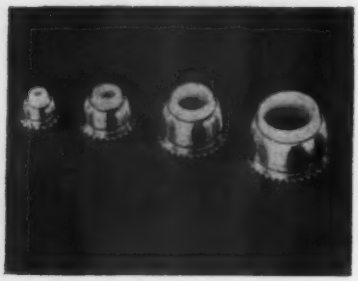
Diamond-Edged Knives Give Metal Specimens 0.000,0005-in. Thick

Diamond-edged knives that will cut metal to half-millionth-inch thickness permit electron microscope specimens to be prepared by slicing. Furthermore, metal specimens for ordinary microscopic examination can be obtained without grinding and polishing.

The knives, which can be provided in sizes up to ¼-in., are said to give tolerances 10 times more accurate than the usual tenths that are obtained by other mechanical means of specimen preparation. The manufacturer will supply sharpening service.

E I DuPont de Nemours & Co, Wilmington, Del

MORE DATA? Circle 54, inside back cover



Self Clinching Bearings Align With Shafts up to 5° off Center

This self-aligning bearing mounts on 0.040 in. or heavier sheet metal with a self clinching retainer. Self alignment is good to 5 degrees off the center line around the full 360 degrees. Bearings are made of Delrin and have steel, aluminum or stainless retainers. The aluminum retainers can be mounted in materials of Rh 50 B or less; the steel types, in materials of Rh 70 B or less.

Assemblies, which are available in shaft sizes from 1/32 to ¼ in., are designed to center in a prepared hole, clinch securely, and resist torque. They can be removed with a press to install a new bearing at least three times without loss of holding power.

Spyraflo, Inc, Subs of Penn Engineering & Mfg Corp, Drawer E, Miami 64, Fla

MORE DATA? Circle 55, inside back cover

Tape-Controlled Welding System Selects up to 10 Weld Conditions

Welding system known as PAWS-1 can store information on up to 10 weld conditions on tape. The operator inserts the parts and actuates the head only. When this is done, all

force and heat settings are automatically set by the system.

Lighted control buttons indicate the selected weld condition while the exact process sequence number appears. This correlates operator parts instructions and system conditions.

Welding energy for each weld condition is adjustable up to 80 watt-seconds and electrode force is adjustable from 4 oz to 15 lbs. In operation, weld conditions are predetermined for a given workpiece, the resultant heat and force settings are then set on the control panel, and the tape is punched for the desired sequence and repeatability of each weld.

Weldmatic Div, Unitek Corp, 950 Royal Oak Drive, Monrovia, Calif.

MORE DATA? Circle 56, inside back cover

TRANSISTORIZED DIGITAL PROCESS controllers accurately count pulses from all types of sensing devices to indicate and control functions of other equipment when a preset count is reached. Line of controllers is available for applications in automatic cutting-to-length lines and other automated production lines—*The Louis Allis Co, Dept P, 427 E Stewart St, Milwaukee 1, Wisc*

MORE DATA? Circle 58, inside back cover

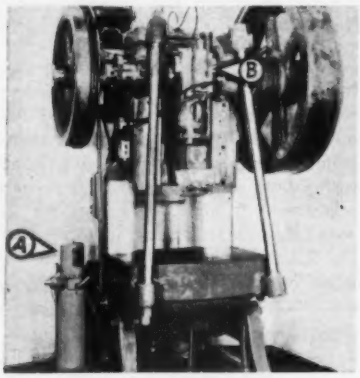
4th Position Universal Slide Fits Model B Davenports

Slitters 4th or D position slide will mount separate toolholders or toolholding blocks on which lateral adjustments may be made. While the slide remains mounted on the machine, toolholders are easily installed and removed as job setup changes require.

The slide will hold a shave toolholder and block, a knurl toolholder and block, or a flat, circular, or dovetail form toolholder. Use eliminates necessity for laterally adjusting toolholders at all other work spindles to a combination 4th position slide and toolholder.

Screw Machine Tool Co, 17565 Swift Ave, Detroit 3, Mich

MORE DATA? Circle 59, inside back cover



Hydraulic Overload Pitman Has New Design Features

Newly designed equipment can be used on practically any power press for such applications as briquetting, coining, embossing, riveting, pressing, sizing, staking, subassembly, or swaging.

The pitman or strap in the average power press is replaced by this equipment which is provided with a pressure pump. Installation is simple and it will reportedly eliminate any damage to the press, crank, or frame. Calibrated relief valve can be set at any desired working tonnage for the protection of the maximum press capacity to protect a given set of tools or dies. It is of tremendous advantage on what is known as double headers on all forming operations. Pneumatic pumping unit keeps a constant oil pressure on the pitman cylinder. Relief valve is pneumatically controlled by an automatic regulator and gage.

Dayton Rogers Mfg Co, 2824 13th Ave South, Minneapolis 7, Minn

MORE DATA? Circle 57, inside back cover

J&L Adds Two Economy Models, One Large Screen Instrument to Comparator Line

Two economy model comparators are direct projection machines for viewing shadow images on suitable flat surfaces in a dark or semi-dark room. Model DPC has a single column support and a measuring capacity of 4 in. vertically and 5 or 8 in. horizontally, depending on the worktable selected. Model DPC-ER has a double column support and a measuring capacity of 8 in. vertically and 10 in. horizontally.

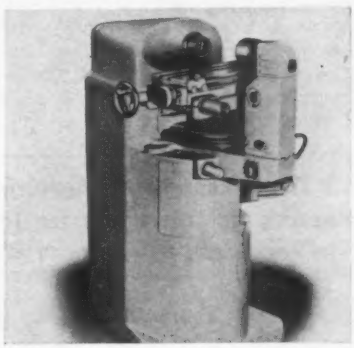
Both models give full coverage up to 60 in. screen size at all magnifications. Lenses provided are for magnifications from 5x to 100x, with more powerful lenses available for special applications.

Also introduced is a new 14-in. screen optical comparator and measuring machine designated model FC-14 ER. This machine is said to be particularly suitable for inspection of parts such as lead screws, die bodies, castings and forgings, and large circuit boards.

The work table of this machine is 32 in. long and 8 in. wide and is supported on two columns that have 10-pitch hardened and ground lead screws.

Telecentric optical system of the machine provides lenses that are matched and preset for exact rated magnification on master optical benches. Therefore, no adjustments are needed to change magnifications.

Lateral measurements are controlled by a micrometer graduated to 0.001 in. in both directions and vertical measurements are read directly from a measuring dial also graduated in 0.0001-in. increments in both directions. Angular measurements are read directly to one minute of arc from a graduated chart ring and vernier.

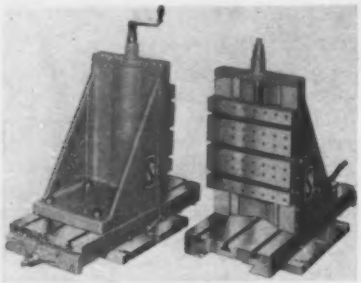


Standard features include: electronic variable speed power elevation for fast motion positioning and for vertical measurements to 0.0001 in. in slow motion; variable light intensity control with built-in filiment warm up for long lamp life.

As optional features the company offers a six position automatic indexing lens selector and a new internal normal reflection unit that is said to add 55% more to the effective light produced by the 1200 watt light source.

Jones & Lamson Machine Co, Springfield, Vt

MORE DATA? Circle 60, inside back cover



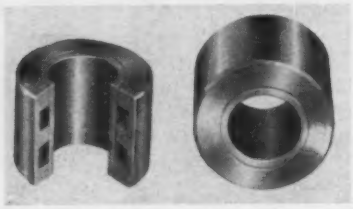
Universal Fixture Engineered For Precision Boring Machines

This universal boring machine fixture is a combination of two units. The four T-bolts permit rapid removal of the vertical angle plate feed to permit independent use on other machines, or for fixturing or bench work. The base mounting holes on either feed are concentric to permit mounting or assembly as preferred. The horizontal feed illustrated with hand feed may also have hydraulic operation. Design features include T-slots, gib screws, manual feed lock, and micrometer dial with crank handle on each feed. Vertical feed platen has a combination mounting area of T-slots and multiple tapped holes to hold securely the tool or the work.

Each slide has a 12-in. width. The angle plate with 7-in. travel has a 12 x 14½-in. mounting base and 12 x 12-in. T-slotted platen. The horizontal slide with 12-in. travel has a 16 x 16-in. base, 12 x 28-in platen.

Standard Electrical Tool Co, 2480 W Sixth St, Cincinnati 4, Ohio

MORE DATA? Circle 61, inside back cover

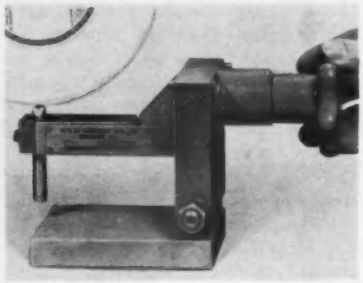


Sleeve Bearings Feed Lubricant To Shaft From Oil Reservoir

Sleeve type bearings for areas in which periodic lubrication is difficult have a machined steel outer sleeve or cartridge on which an oil reservoir, in the form of internal grooves, has been provided. This reservoir is filled with a special oil during assembly of a sintered bronze bushing and provides a continuous oil film between the assembled bearing bore and shaft by cappillary action through the bushing. The bearings are furnished in bore sizes from ⅛ through ⅜ in. ½ in. bore sizes and larger, are interchangeable with some standard sizes of needle bearings.

Carter Mfg Co, Ferrysburg, Mich

MORE DATA? Circle 62, inside back cover



NEW MODEL SS RADIUS DRESSER dresses all abrasive wheels up to and including 14-in. diameter with an accuracy of 0.0002 in., according to the manufacturer. The dresser operates from below so that there is no need to remove the wheel guard. To set the point, a micrometer is used to measure from the top of the measuring hood to the bottom of the dresser arm, and adjustment from 90 through 180° is aided by four stop pins—*Somerset Tool Co, 220 Virginia St, Hillside, NJ*

MORE DATA? Circle 63, inside back cover

SIP Three-Coordinate Measuring Machine Requires No Corrections for Temperature

The Trioptic—SIP's new universal measuring machine, with three coordinates, being introduced at Brussels——has a standard steel scale as its metrological basis. Therefore, since the coefficient of thermal expansion of these scales is practically the same as that of the machine itself, no correction is necessary for cast iron and steel parts.

Accuracy of each of the coordinates is 20 millionths plus 0.000,00125 for each inch of the dimension being measured. For example, over four inches, accuracy is guaranteed within 25 millionths.

All readings of carriage and toolholder positions are displayed on projection screens which lessen operator fatigue and reading dispersion. An automatic correction system for parallax errors (between the axis of toolholder and vertical standard scale) is incorporated. The feeler microscope mounted on the toolholder is a regular accessory. All eyepieces are horizontal, but images are never reversed.

The massive machine bed is supported on three points so that it is independent and, therefore, not influenced by any deformation of the foundation. The V- and flat guideways are handscraped for precision, and are long enough to insure no overhang of any moving member.

Measuring range of the machine is: longitudinal travel, 16 in.; transverse travel, 8 in.; vertical travel, 8 in. However, because of a unique clamping setup and allowance for raising the microscope, workpieces up to 14 in. high can be measured.

One accessory is a 11.8-in.-diameter circular rotary table which has readings on the graduated limb of the screen of 1 second, and has a guaranteed positioning accuracy of 3 sec. Other tables, microscopes, and heads are available as accessories.

American SIP Corp, 100 E 42nd St, New York 17, NY

MORE DATA? Circle 64, inside back cover

NOW...
CONTINUOUSLY VARIABLE RANGE OF SPINDLE SPEEDS
WITH CONSTANT HORSEPOWER THROUGHOUT

Now, by simply pressing a button until the desired speed is indicated on the direct-reading tachometer, you can select any spindle speed from 43 to 3500 RPM.
The new Micro-Turn features exclusive Nebel coaxial headstock spindle design plus mechanical beltless type variator drive unit (5 HP), which delivers constant horsepower throughout the entire range and maintains drive output speed within two-tenths of one percent. This assures maximum torque at low speeds for heavy cutting and ultra fine finish at highest speeds, with supreme balance and minimum vibration. Built-in positive torque responsive mechanism prevents slippage under starting or shock loads.

Other features include:

- exclusive feed converter unit, located in apron, providing simple conversion from standard to optional feed ranges without affecting standard thread ranges;
- double-wall, one-piece totally enclosed apron;
- fail-safe pressure lubrication to headstock, gear box and end gearing;
- pressure lubrication to carriage and cross slide ways provided by pump located in apron; one-shot plunger to lubricate cross slide ways when carriage is stationary;
- choice of manual or automatic coolant operation.

For the complete, illustrated story on the revolutionary MICRO-TURN, write today for your copy of Bulletin No. 222. Nebel Machine Tool Corporation, Lathe Division, 3407 Central Parkway, Cincinnati 25, Ohio.

NEBEL
MICRO-TURN
HIGH SPEED PRECISION LATHE

CIRCLE 345 READER SERVICE CARD

De Valliere Boring Machine Features Feeds Controlled by Leadscrew, Automatic Cycling

This precision boring machine has feed rates from 1/3 to 11 ipm obtained through a leadscrew. Rapid traverse in both directions is provided by a separate motor and electric brake and can be set at either 72 or 144 ipm. A set of adjustable cams fixed on the table and acting on microswitches allow automatic cycling on this French machine.

All operations including fast approach, cutting feeds, starting and stopping the spindles, fast traverse, interrupted cuts, positive stops, and fast return can be included in the automatic cycling.

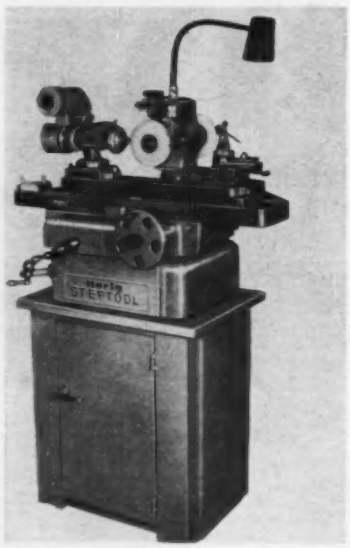
Because it has mechanical feed, thermal distortion of the machine elements is minimized, and, without oil circulation and cooling, ambient temperature rise at 2000 rpm is less than 7 C. With oil circulation, temperature is maintained within 4 C at maximum spindle speed of 4000 rpm.

Boring heads have Gamet high precision bearings that reportedly give accuracies of 0.00001 in. in roundness in light alloys with low feed rates.

Table track is hand scraped to 0.0004 in. per foot so that tracking differences on bores up to 4 in. long are not measurable, according to the manufacturer.

Distributed by George Sharp Inc, Hasbrouck Hgts, NJ

MORE DATA? Circle 65, inside back cover



Harig Drill Point Grinder Doubles as Cam Relief Machine

Floor model relief grinding machine performs both as a drill point grinder and a cam relief grinder.

As a drill point grinder the machine grinds original points and resharpens any style drill including split crankshaft points, helixpoint, spiral, chisel, conventional sheet metal, three and four lip core drills. Indexing and concentricity are said to be in tenths, and changeover to different sizes, angles and styles is reportedly accomplished in seconds.

As a cam relief grinder, it will grind with eccentric relief, step drills with or without marginal relief, taps, countersinks of every style, including uniflutes, center drills, double margin drills, subland drills, and valve-seating tools, and special tools with sharp contours.

Corners on step drills to 0.001 in. and with no undercut are ground with a system that grinds above center and allows the use of large diameter grinding wheels for this work.

Range of work is from 1/64 to 1 1/32 in. left or right hand. There is no limit to flute numbers, and a full set of 66 collets for gripping flutes come with the machine. As optional equipment a headstock is offered that converts the machine to an end mill and milling cutter sharpener.

Harig Mfg Corp, 5757 W Howard St, Chicago 48, Ill

MORE DATA? Circle 66, inside back cover

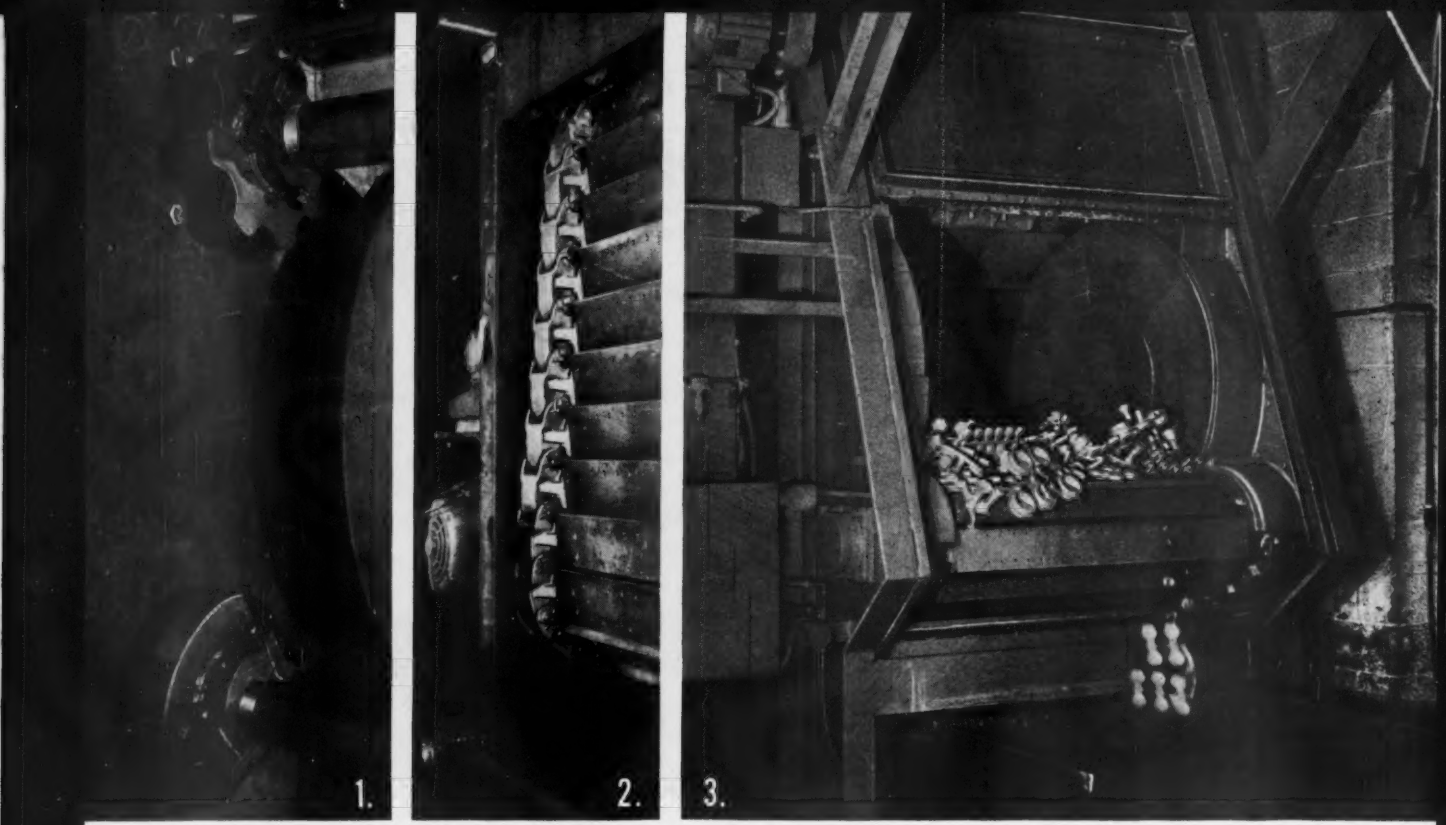
Small-Parts Feeder Designed With Adjustable-Width Track

Model FE-101 piece-part feeder, built in two sizes, has a divided track, adjustable in width, which can be furnished for use with headed parts. Unit is designed for operation with various types of assembly and other equipment, including Dixon positioners and auto-torque drivers.

In order to provide for installation in close quarters, the width of both feeders has been held to a minimum by use of the horizontal-axis drum; this also allows for unusual bowl capacity. Model FE-101 is 6 in. wide and has a storage capacity of 150 cu in.; Model FE-104 is 10 in. wide with 700 cu-in. capacity. The feeders can be furnished fully tooled for the job or with a blank track ready for machining to suit the part.

Dixon Automatic Tool Inc, 2300 23rd Ave, Rockford, Ill

MORE DATA? Circle 67, inside back cover



1. These sprockets and drive gears, made of USS FREMAX 45 steel are salt bath case hardened to reduce wear and increase service life. 2. This armored conveyor belt, combined with the abrasive action of the shot, caused a lot of wear to the sprockets and drive wheels. 3. The manufacturer of these shot blast cleaning machines specified free-machining, flame-hardening FREMAX 45 Plate Steel to increase wear resistance and improve the service life.

Fremax 45 solves difficult wear problem

In designing a new abrasive blast cleaning machine, a prominent equipment manufacturer specified USS FREMAX 45 free-machining, flame-hardening steel for several critical wearing parts . . . sprockets and traction wheels. These elements are subject to both abrasive wear and friction from the action of the conveyor belt linkage. After literally thousands of hours of usage, FREMAX 45 has proved to be ideally suited to this application.

The parts are flame cut, four at a time, on an automatic rig. A tolerance of $\pm\frac{1}{32}''$ is easily held on the $1\frac{1}{2}''$ and $1\frac{3}{4}''$ plate. After grinding off the burrs, a clamping collar, also made of FREMAX 45, is welded on using E7016 low hydrogen electrodes. Before case hardening in molten salt, the holes for clamping bolts are drilled. A salt bath is used for hardening instead of the flame hardening process because the hardening effect is more uniform and penetrates to a greater depth. The treated parts have a Rockwell "C" scale hardness of 55-58 up to a depth of $\frac{1}{4}''$ and there are no soft spots. Shrinkage in either hardening operation is negligible.

USS FREMAX 45 free-machining, flame-hardening plate steel, machines so well that some users have been able to almost double their milling speed. It is available at your local Steel Service Center or in mill order quantities through USS District Sales Offices. For full information about the "steel that does more," just mail this coupon. USS and FREMAX are registered trademarks

United States Steel Corporation • Columbia-Geneva Steel Division • National Tube Division • Tennessee Coal & Iron Division • United States Steel Supply Division United States Steel Export Company

This mark tells you a product is made of modern, dependable Steel.

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Room 6329
525 William Penn Place
Pittsburgh 30, Pa.

Please send me your free machining steel plate book—USS FREMAX.

Name_____

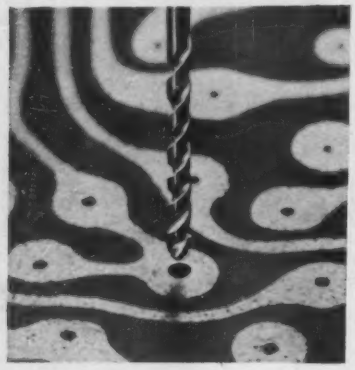
Title_____

Firm_____

Address_____

City_____ Zone____ State_____

(Please type or print plainly)

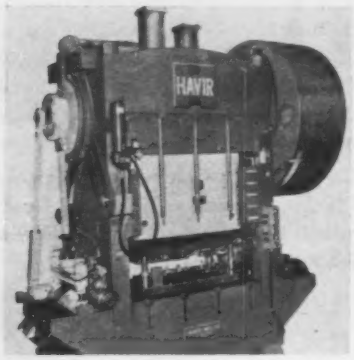


Carbide Drill Designed For Plastic Materials

Ez-Drill is designed to run cool and retain necessary accuracy in hole sizing in such products as printed circuit boards made of Hi-hard plastics. Geometry of the point and extremely sharp cutting edges give the tool a free-cutting capability that keeps heat at the drill point to a minimum. Circuit boards can be cut instead of punched, eliminating much scrap loss and reworking, and allowing an extremely accurate press fit in just one operation even in critical tolerance circuit boards.

Dixie Tool Industries Inc, Bridgeport, Mich

MORE DATA? Circle 68, inside back cover



150-Ton Auto-Press Introduced by Havir

High-speed automatic press has a cylindrical type ram for precision alignment of die and ram with maximum ram rigidity. This design is said to increase die life up to 50% over conventional presses. The ram has maximum guiding surface to insure proper guiding of ram, punch, and die. Use of tapered wedges behind ram bearings allows takeup. Dies are further guarded with automatic shutoff.

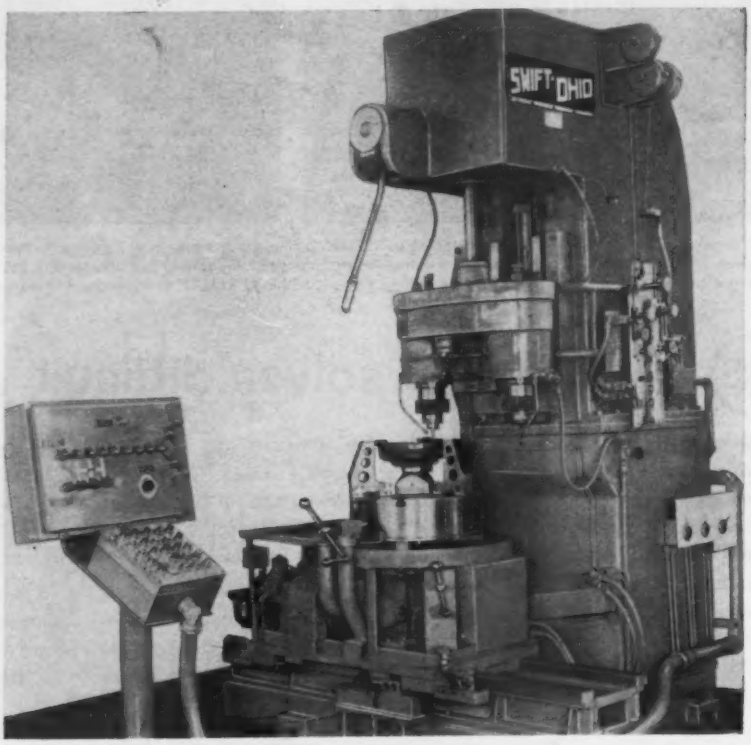
Standard operational speeds are 70 to 210 spm using an 18-in.-wide feed. Slower speeds can be ordered. Features include air-clamped feeds that prevent stock distortion and allow infinite controllable variations of roller pressure; built-in shock mounts that allow press operation on any reinforced cnocrete floor; spring applied brake. Press is furnished with an adjustable speed 20-hp motor. Crankshaft diameter at the main bearings is 6¾ in. with a diameter of 8½ in. at the crankpin. Bed width front-to-back is 32 in. and bed opening is 30 x 18 in. or 46 x 18 in. Length of ram is 28 x 32 in.

Havir Mfg Co, 444 N Cleveland Ave, St Paul, Minn

MORE DATA? Circle 69, inside back cover

TORQUE WRENCH has memory finger that remains at the reading of peak torque. This enables operators to take peak readings without constantly watching the gage on the wrench to determine the reading at the point of failure of a bolt or nut—*P A Sturtevant Co, Addison, Ill*

MORE DATA? Circle 70, inside back cover



Swift Ohio Drilling Machine Needs Few Jigs or Fixtures, Gives Fast Easy Setups

Many jigs and fixtures are eliminated in normal drilling, tapping, and boring operations on this No. 415-H drilling machine which incorporates the positioning Blox method with push button selective control, rotary index sequencing, and vertical or horizontal programming.

The machine shown has two spindle heads and a rotary selective index table for drilling and tapping holes in bolt circles of 2 to 14 in. diameter to 2 in. thickness in mild steel. Rotary index sequencing and vertical and horizontal programming are easily combined as auxiliary functions through memory circuit control panels. Cycling can be automatic electric or selective manual.

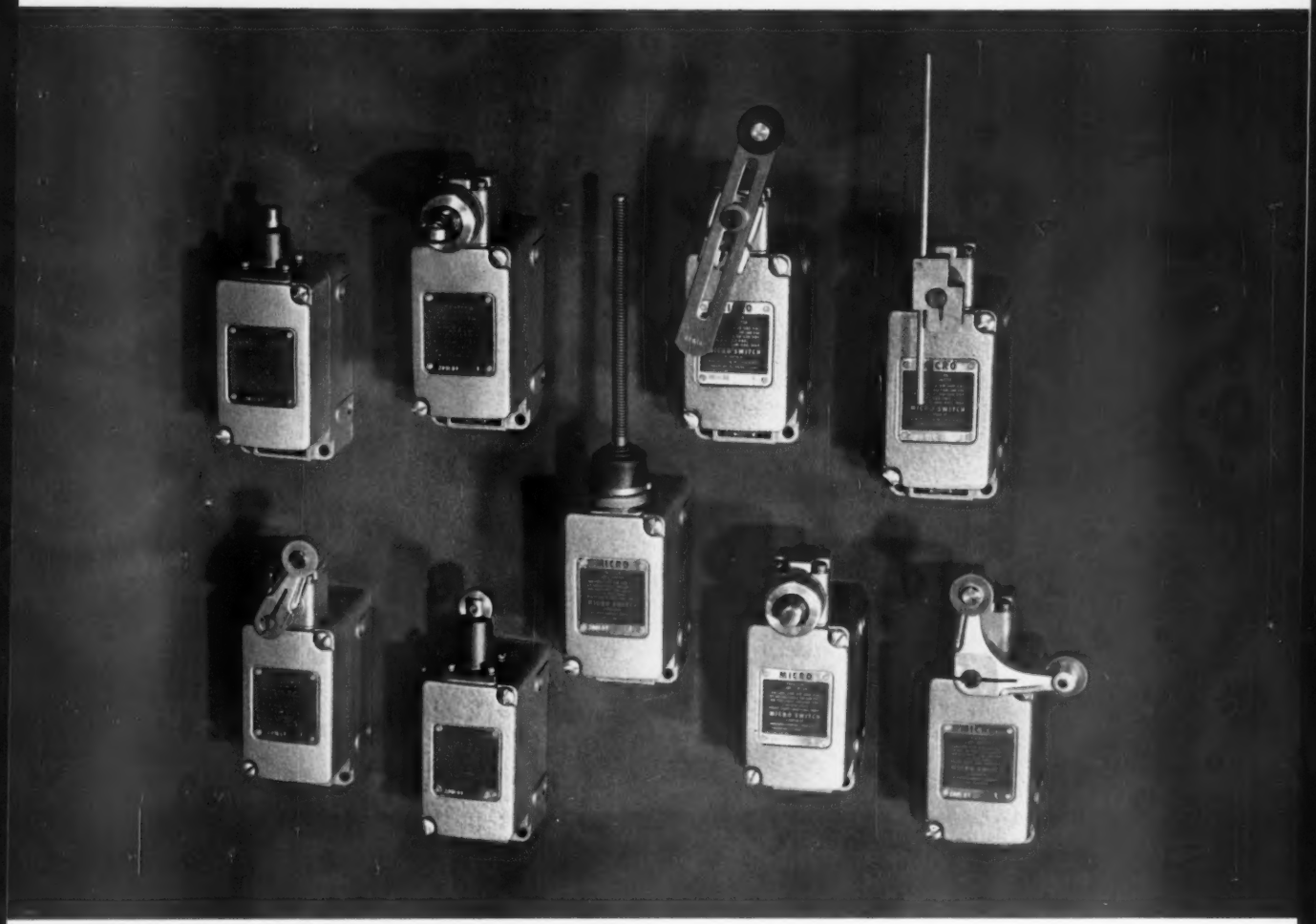
Drilling machine setup is said to be simplified through direct reading scales and cams that determine the location of the positioning Blox. Complete setup time from one size part to another is reportedly less than ten minutes.

Swift Ohio Corp, Kenton, Ohio

MORE DATA? Circle 89, inside back cover

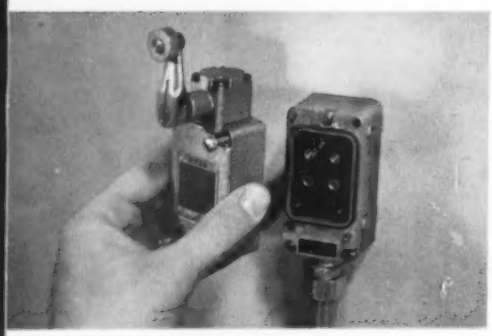
CIRCLE 347 READER SERVICE CARD ►

MICRO SWITCH Precision Switches



Cut downtime to 20 seconds with

MICRO SWITCH "Plug-in Limit" Switches



The terminal block, permanently mounted, has no parts to wear out. The actuator-switch assembly plugs in like a radio tube.

The oil and liquid-tight seals and the wear resistant qualities of "200LS" snap-action limit switches make them ideal for use as dependable long-life safeties, limits and interlocks in the most severe industrial applications.

Spring plugs integrally molded into the precision snap-action basic switch in the actuator assembly plug into the integrally molded terminal receptacle. Two captive screws and a ring gasket seal the two units together.

Nine standard and many special actuators are available. The basic switches are two-circuit double break. Actuator heads are adjustable to four positions and the terminal blocks may be mounted from the side or back, providing extreme versatility for changing production requirements.

For further information, see the Yellow Pages for the nearest MICRO SWITCH branch office or distributor or write for Catalog 84.

MICRO SWITCH . . . FREEPORT, ILLINOIS . . . A division of Honeywell

In Canada: Honeywell Controls, Limited, Toronto 17, Ontario

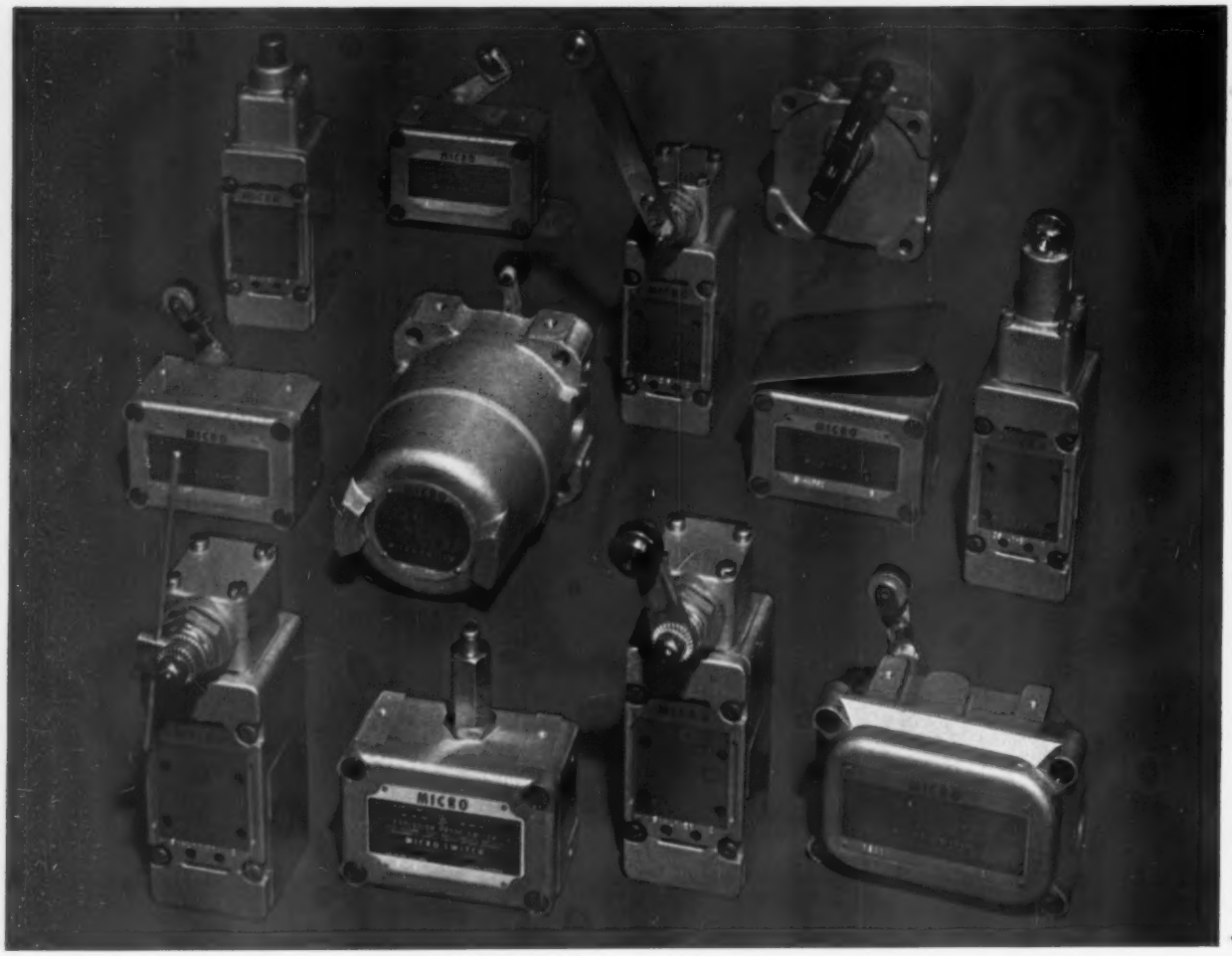
HONEYWELL INTERNATIONAL

Sales and service offices in all principal cities of the world. Manufacturing in the United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

Honeywell

MICRO SWITCH Precision Switches

MICRO SWITCH Precision Switches



Added safety for switching in danger areas

EXPLOSION-PROOF Switches

"CX" series explosion-proof switches are rain and dust tight—valuable protection in hazardous outdoor locations. Note the two gasket seals and the accessibility for wiring to the two enclosed s.p.d.t. switching units.

MICRO SWITCH explosion-proof switches provide safe limit or interlock control functions in hazardous areas where there is danger of explosion of dust or volatile vapors. They are designed for heavy duty performance under the most severe operating conditions. The enclosed and well protected snap-action basic switching elements combine precision with long life.

All switches in this family are listed by Underwriters' Laboratories for use in hazardous atmospheres Class I, Groups C and D; Class II, Groups E, F and G. Some are also listed for Class I, Group B.

Available with a variety of actuators, circuit arrangements, electrical ratings, and operating characteristics.

See the Yellow Pages for the nearby MICRO SWITCH branch office or distributor, or write for Catalogs 83 and 84.

MICRO SWITCH . . . FREEPORT, ILLINOIS . . . A division of Honeywell

In Canada: Honeywell Controls, Limited, Toronto 17, Ontario

HONEYWELL INTERNATIONAL

Sales and service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

Honeywell

MICRO SWITCH Precision Switches

6 WAYS TO SAVE MONEY
IN YOUR DEGREASING OPERATION

...from the makers of COLUMBIA-SOUTHERN TRICHLOR

1. Keep your solvent in the machine

Your solvent can't clean much metal when it's floating around in the air. Prevent drafts which remove solvent. Check open doors, windows and location of fans. Keep cover on unit during idle periods—solvent evaporates whether it's hot or cold.

2. Don't waste heat

By keeping your heating and condensing coils clean, you can operate your equipment at the design rate and thus control resultant waste of solvent and heat. Make sure the thermostats are kept clean and functioning properly.

3. Make sure your solvent is formulated for the job

Columbia-Southern Trichlor contains a special neutral stabilizer which enables it to stand up under continuous operation with high contamination rates. Trichlor's stabilizing system is designed specifically to permit you to handle aluminum as well as other metals safely in the degreaser.

4. Establish good cleanout procedures

Keep an eye on sump temperatures, and distill in time to avoid excessive contamination and low heat transfer. You not only get more efficient operation, but you may also save your equipment and reduce operating costs.

5. Protect equipment investment with scheduled maintenance

Schedule routine maintenance on valves, pumps, piping, gaskets and water separator; regular attention to little items prevents emergency repairs to the whole system.

6. Keep down dragout losses

Handle and rack your work properly. We often find that the type, shape and weight of parts going through machines are not given proper consideration. Liquid solvent may be trapped or vapor levels dropped as a result. A review of these factors, plus location of sprays, and throughput speed can reduce waste by a healthy figure.

These simple but effective rules have been developed by the Technical Service group at PPG's Chemical Division, as a result of hundreds of service calls and years of experience in applying Columbia-Southern TRICHLOR to degreasing operations.

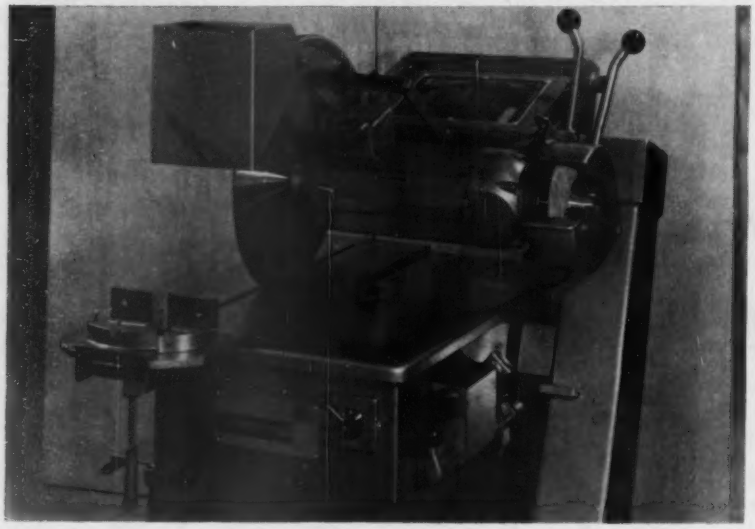
Trichlor is built for the job, starting with a "triple-check" quality control system during manufacture. The stability, uniformity and purity of Trichlor are guarded by the blending in of carefully compounded *neutral* stabilizing agents which maintain the solvent in a safe, effective state through the toughest service.

Save money in your vapor degreasing operation by following the six rules above and specifying Columbia-Southern Trichlor. Call your nearby Trichlor distributor or the Columbia-Southern office serving your area.

PPG columbia | southern chemicals
CHEMICAL DIVISION
PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER PITTSBURGH 22, PENNSYLVANIA
DISTRICT OFFICES: Boston • Charlotte • Chicago • Cincinnati • Cleveland Dallas • Houston • Minneapolis • New Orleans • New York • Philadelphia Pittsburgh • San Francisco • St. Louis • IN CANADA: Standard Chemical Limited

◄ CIRCLE 348 READER SERVICE CARD

CIRCLE 349 READER SERVICE CARD



Promacut Combination Saw and Grinder Gives Fast Burr-Free Cuts Without Blueing

Single unit that combines a metal saw and a general purpose grinding wheel, the Promacut Uni-14 SA makes accurate cuts of all types in carbon and stainless steel as well as many of the new alloys.

Straight cuts, mitres, notches and incisions can be made by either free-hand or table cutting.

The 14 SA employs the same principle as larger units produced by the manufacturer. This involves tooth design that produces a semi-milling action rather than biting and chipping in the manner of conventional cut-off equipment. Speed of rotation and high torque of the 5-hp direct drive motor is said to move the blade through the work so fast that heat is not absorbed so that the cut is almost burr-free and no blueing occurs.

Through cuts on 2 by 2 by ⅛ in. angle stock are made in 1 second or less and up to 2500 such cuts can be made without resharpening.

Production Machinery Inc, 4941 West Belmont Ave, Chicago 41, Ill.

MORE DATA? Circle 71, inside back cover

Direct-Action Gages Calibrated In Four Pressure Ranges

Line of compact hydraulic gages is protected from shock damage and pressure overloads by a built-in dampening device and a positive stop position. Units are 2¼ in. wide x 2⅝ in. high x 1½ in. deep and are enclosed in aluminum cases with clear plastic faceplates. To maintain accuracy after long periods of use, a front-of-gage adjusting screw permits re-setting to zero. These gages are available in 0-500, 0-1500, 0-3000, and 0-5000 psig ranges.

A Schrader's Son, 470 Vanderbilt Ave, Brooklyn, NY

MORE DATA? Circle 72, inside back cover

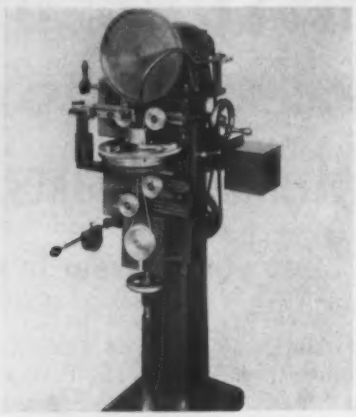
Torches for NG and Propane Operate From 3 oz Up

Universal line of cutting torches, identified by product numbers 62-2F (90° head) and 62-2AF (70° head), is designed specifically for natural gas and propane and to operate at any pressure above 3 oz.

A range of tips is available to provide extra fast pre-heat for scrap yard and demolition work. Also available are tips for precision cutting, gouging, rivet washing, rivet cutting, and heating.

Harris Calorific Co, 5501 Cass Ave, Cleveland 2, Ohio

MORE DATA? Circle 73, inside back cover



Abrasive Belt Machine Polishes Dies Parallel to Line of Draw

Abrasive belt die polishing machine polishes dies parallel with the line of draw of the work through the die. This is said to result in a finer finish for the dies so that die life is increased.

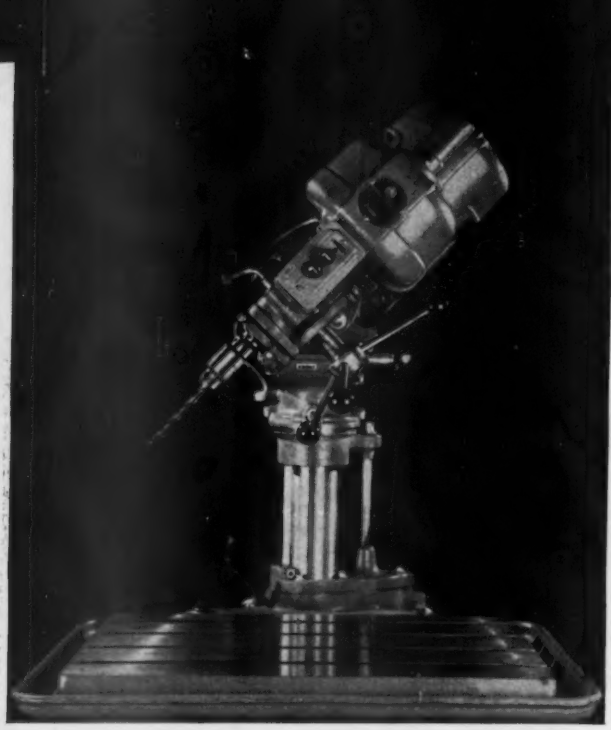
In operation, the die and work-holding chuck are placed on the revolving work supporting table which is mounted on a slide on the front of the column. This table is elevated or lowered by a handwheel on the side of the column.

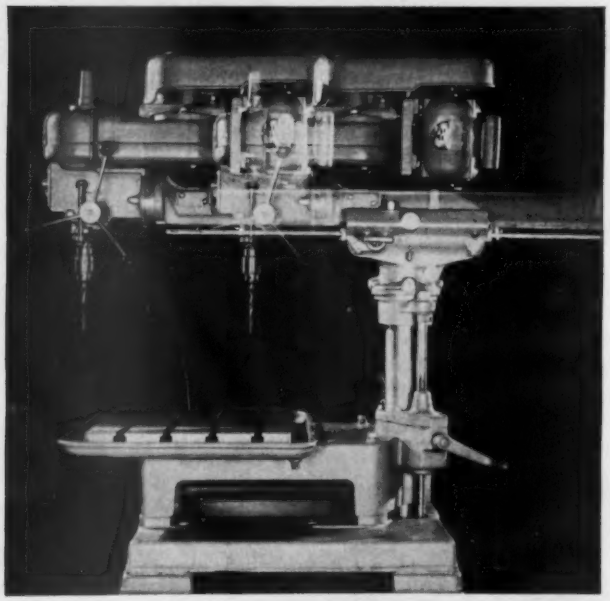
A slide below the table carries a flanged tension pulley that is raised or lowered with a hand wheel, or a hand lever. The belt is placed over the driving and top idler pulleys, through the opening in the die and work-supporting table and then slipped around the tension pulley. The table and the top idlers are then positioned so that the belt contacts the entire drawing surface of the die. If the edge on the discharge side of the die is not to be polished, the two idlers under the work table can be adjusted so that the belt will not bell-mouth this edge.

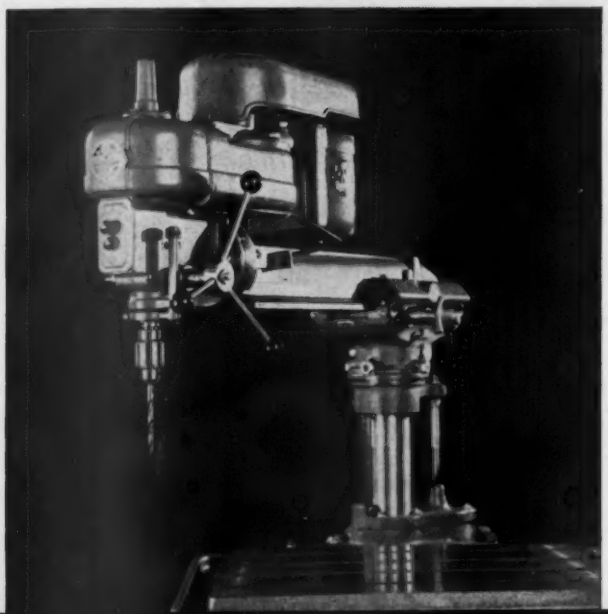
The machines are made in two sizes; machine No. 2 takes work from ¼ to 3½ in. ID and machine No. 3 takes work from 2½ to 9 in. ID. Both operate the abrasive belt at 5,000 lineal ft per min.

The Parker-Hartford Corp, Hartford, Conn

MORE DATA? Circle 74, inside back cover







Any way you look at it

YOU CAN'T BUY MORE *FLEXIBILITY*

At a low price of $760.00* Walker-Turner "Light-Heavyweight" Radial Drill Presses do the work of machines costing more than twice as much! For fast set-up in drilling of large or heavy stock and to solve special horizontal or vertical drilling problems they offer these important extras: *Extra wide drilling range*—head moves 18" on traveling ram, swivels 360° around column, tilts 45° left or right. *Extra speed versatility*—choice of 15 speeds from as low as 110 rpm to as high as 8300 rpm. *Extra capacity*—drills to center of 62" circle, your choice of 4¼" or 6" spindle travel. But the biggest extra is the extra savings you'll enjoy on fixturing and set-up time when you put this rugged machine to work on your toughest drilling jobs.

Visit your Walker-Turner Distributor (listed in the Yellow Pages under MACHINE TOOLS or TOOLS). Learn for yourself why more people in metalworking call Walker-Turner the *value* line.

**Model 65-202*

Get information on all 24 models of the W-T Radial Drill Press. Write for FREE Catalog: Rockwell Manufacturing Company, Walker-Turner Division, Dept. WJ-21, 400 North Lexington Ave., Pittsburgh 8, Pa.

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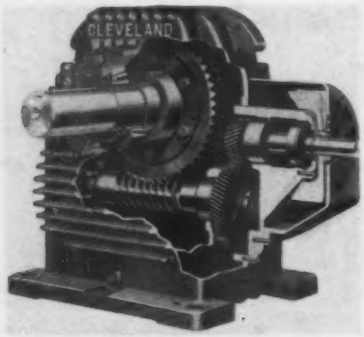
"LIGHT-HEAVYWEIGHT" MACHINE TOOLS
another fine product by
ROCKWELL

CIRCLE 350 READER SERVICE CARD



Speed Reducers Available In Ratios From 34:1 to 394:1

Fan-cooled helical worm gear speed reducers are furnished in seven sizes ranging from 4 to 12-in. center distances. Ratings: fractional to 58.5 hp.

Helical primary gears are cut from high-hardness steel. In the secondary reduction, worms are machined from medium carbon steel hardened by the Flamatic process which results in a high degree of hardness to well below the root diameter while maintaining the advantage of a core of medium strength. The worm gears are cut from bronze of a high tin-copper content and are bolted or mechanically keyed to cast iron hubs.

On larger sizes, both primary and secondary gear trains share a common housing; separate housings are used on 4 through 6-in. sizes. Shafts are supported by ball and tapered roller bearings.

Cleveland Worm & Gear Div, Eaton Mfg Co, 3300 East 80th St, Cleveland 4, Ohio

MORE DATA? Circle 75, inside back cover

Wet Blast Unit is Designed for Finishing Large Workpieces

New model AA-77 wet blast cabinet and Rollo-table attachment are specially designed for wet blast finishing and convenient handling of large, heavy workpieces such as plastic molds, die casting dies, forging dies, and engine components.

Workpieces to be processed are placed in the rotary table, manually pushed into the cabinet and processed. After wet blasting, a rotary table is returned to its position over the Rollo-table attachment, rinsed of residual abrasive, and removed.

The cabinet measures 70 by 70 by 108 in. and is fabricated of 304L series stainless. Two counterweighted side-work loading doors give access areas of 54 by 56 in. to the interior of the cabinet.

A 110-volt connection plus a ½-in. water connection and a ¾-in. compressed air connection are all that are required for immediate operation of the unit.

The Pressure Blast Mfg, Co, Inc, 72 Pleasant St, Manchester, Conn

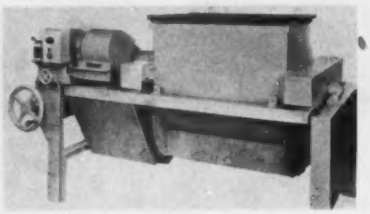
MORE DATA? Circle 76, inside back cover

Fastcut Tapered End Mills Available in 75 Sizes

Tapered N-Mills added to company's cutting tool line are used as die sinking cutters and also for angle or pocket milling. HHS units are three flute with straight shanks. Taper ranges from ½ to 7° per side; diameters of small end are from 3/32 to ½ in. Right hand cut, right hand spiral are standard; left hand cut or spiral are available on special order.

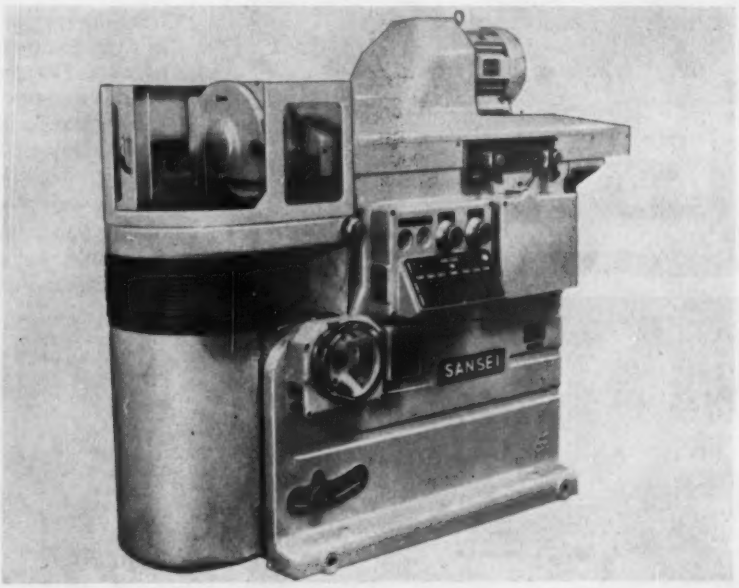
Fastcut Tool Co, 25425 Mound Rd, PO Box 395, Warren, Mich

MORE DATA? Circle 77, inside back cover



VIBRAHONE FINISHING TUB, Honite brand, incorporates rubber mounts instead of springs, and an eccentric drive principle, retaining more than 98% of the generated vibrating force inside the tub. Detachable rubber-lined tub tilts for easy draining—*Minnesota Mining & Mfg Co, 900 Bush Ave, St Paul 6, Minn*

MORE DATA? Circle 78, inside back cover



ROTARY SURFACE GRINDER with 15½-in. capacity magnetic chuck, the SS 4D is powered by a 5-hp grinding wheel motor. Machine features coordinated ram stroke and table rotation, pressure-lubricated, hydraulically-driven grinding head ram, automatic chuck feed system and centrifugal pressure lubrication of the grinding wheel. The completely automatic grinder also has ram speeds from 2 to 55 ipm, chuck speed from 30 to 200 rpm, automatic chuck feed from 0.0001 to 0.001 in. per stroke, and 1900 rpm wheel speed—*Mitsui and Co, Ltd, 530 5th Ave, New York, NY*

MORE DATA? Circle 79, inside back cover

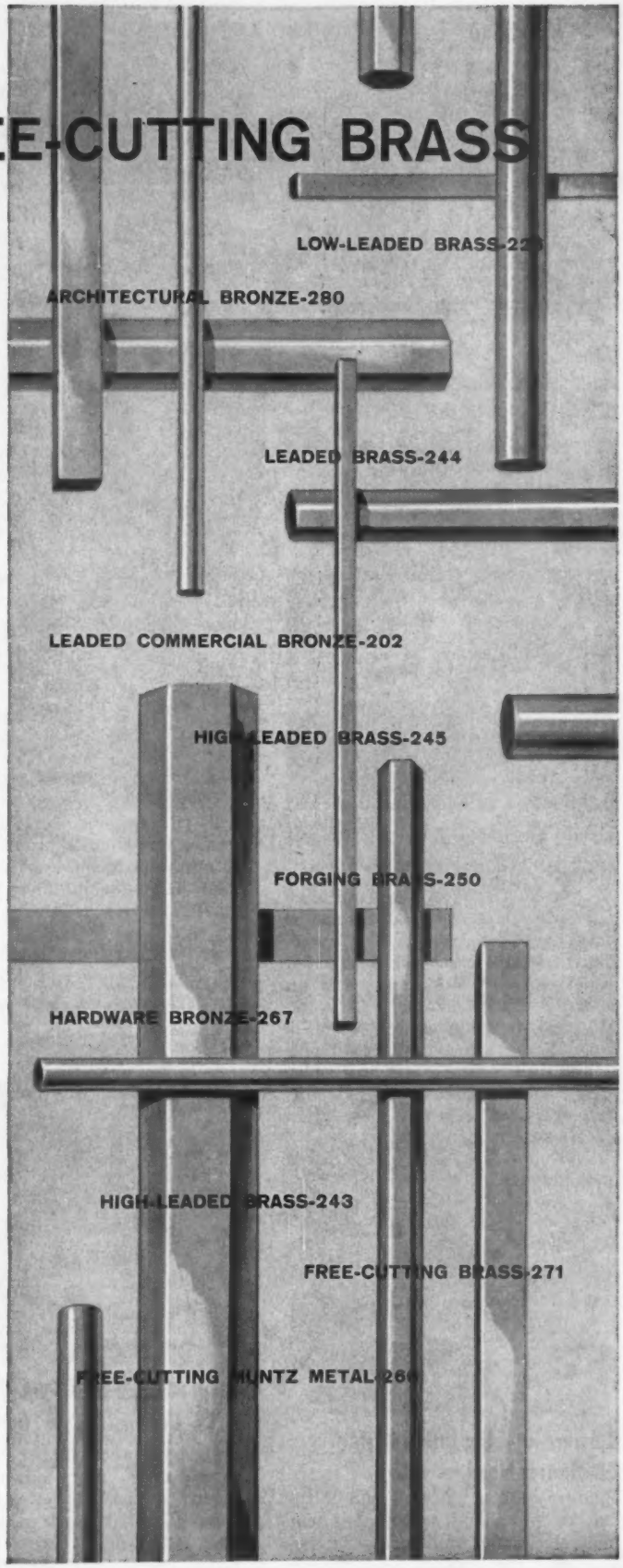
ANACONDA FREE-CUTTING BRASS

Free-Cutting... Cost-Cutting

Year after year after year, engineers who know brass select Anaconda Leaded Brasses for their special characteristics and qualities.

The superior machining qualities of Anaconda free-cutting brass rod permit the use of heavy feeds and high cutting speeds. Tool life is much longer; tool breakage considerably less. Close tolerances are held for longer continuous runs. What's more, you get fewer rejects, more accurate assemblies, and products with better appearance.

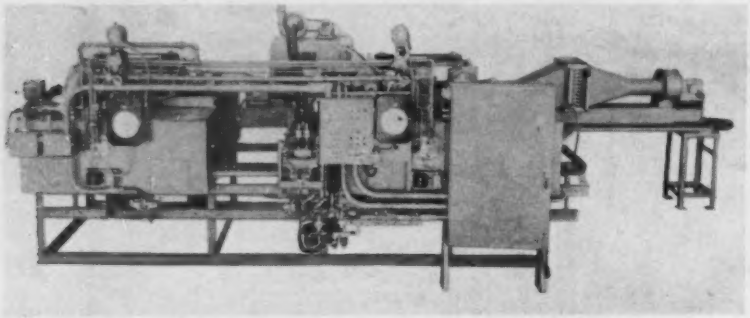
When you buy or specify Anaconda American Brass, you can choose from nearly 300 different alloys . . . the greatest range of sizes, shapes, tempers and characteristics in Copper and Copper Alloys. Contact your Anaconda representative or write: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 61-1147



FREE CUTTING BRASS

a product of

ANACONDA®
AMERICAN BRASS COMPANY



PLASTIC COATING SYSTEM is completely integrated as a unit which preheats, coats, cures, and cools continuously with automatic control of product movement, heating, ventilation, and application of the plastic. Machine shown applies powdered epoxy to a uniform thickness in the slots and onto both ends of a motor armature without coating either the peripheral surface of the armature or the shaft on which it is mounted.—*W S Rockwell Co, 300 Eliot St, Fairfield, Conn*

MORE DATA? Circle 80, inside back cover

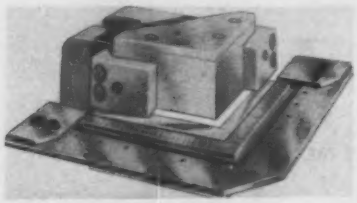
Newly Designed Diamond Wheels Increase Wheel Life up to 15%

Design of D11V9 Turbogrind diamond wheels successfully eliminates excessive heat both in the workpiece and in the bond. Integrated vanes vortex laminar air into an effective coolant flow.

Redesigned thinner core, strengthened by the vanes, cools faster and is selfdressing. Tests show that wheel life is increased as much as 15%. These wheels can be used in wet, mist, or dry grinding.

US Diamond Wheel Co, 835 Illinois Ave, Aurora, Ill

MORE DATA? Circle 81, inside back cover



Corner-Notching Unit's Design Eliminates Need for a Cap

Feature of this self-contained unit is the cast-to-shape tool-steel punch that eliminates need for a cap surrounding the punch and insures burr-free notching of parts. Units can now be used for V notching or cropping of angles as well as V and corner notching of flat sheets.

They are furnished in both right and left-hand models in the RD (regular duty) series, 5½-in. shut-height and 2 19/32-in. die-height, or the HD (heavy duty) series, 8⅜-in. shut-height and 3½-in. die-height. Side gages, or gage plates (illustrated) with the side gages and built-in scales for quick setup, are available on all models. Complete line of RD and HD punching units to work with this series is also available from stock.

Tool Products Corp, 377 Old Falls Blvd, North Tonawanda, NY

MORE DATA? Circle 82, inside back cover

Optical Comparator Weighs 4 oz, Checks Dimensions to 0.0025 in.

Lightweight optical tool that weighs approximately four ounces will measure dimensions of 0.0025 in. without physically superimposing the reticle in the work.

Called the Mirroptic comparator, it consists of a die-cast frame that houses reflective mirror of the beam-splitter type, which allows 50% of the light to be transmitted and reflects the other 50%. This superimposes the reticle image visually but not physically on the work.

The two-element lens gives five-power magnification for parts which are supported at the desired focal plane on a shock-proof, scratch-resistant acrylic plate. Reticles are made of mylar type film and may be turned independently within the reticles to suit any particular measuring job.

National Tool Co, Div of National Cleveland Corp, 11222 Madison Ave, Cleveland, Ohio

MORE DATA? Circle 83, inside back cover

Trim Press Has Fast Approach, Slow Shear Speeds for Clean Cuts

High approach velocity and slow shearing speed of this 2-bar trim press result in clean, neatly sheared castings. Faster operation of the 20-ton press is gained by means of a pressurized hydraulic system that virtually eliminates cavitation and air entrainment or entrapment in the hydraulic circuit.

The two 3-in.-dia. bars are trapped in a two-bearing containment in the base of the press and a similar containment at the top. This provides for maximum stability of the frame and moving platen. Each bar is also fitted with an adjustable safety stop, and the press has a safety stop that will not allow operation until the casting is in proper position.

Greenlee Bros & Co, Rockford, Ill

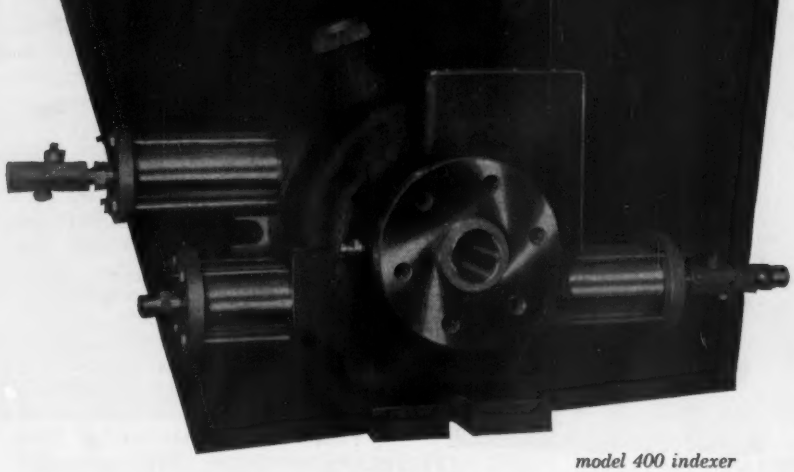
MORE DATA? Circle, 84, inside back cover

For speeding precision production

AUTOMATE

with

Erickson Indexers

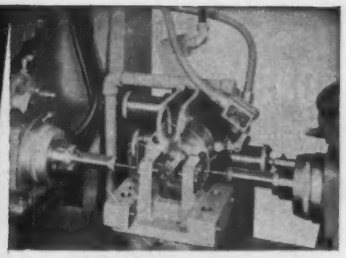


model 400 indexer

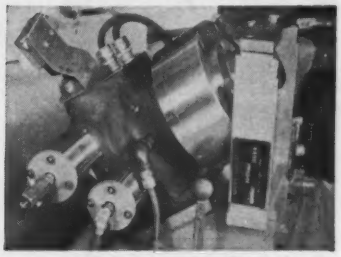
Perhaps these actual applications of automation will trigger your imagination . . . show you how Erickson Indexers can help you smash bottlenecks in your own production operation.

You can interlock them into production setups with microswitches and solenoid valves. And with Erickson Indexers you automatically get consistent positive positioning within 2 minutes of a degree . . . repetitive accuracy in low "tenths" of a thousandth.

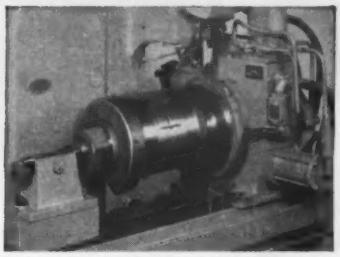
Speed to keep lines humming . . . accuracy to banish rejects . . . long life to slash maintenance and capital investment—all add up to Erickson Indexers. A-1362A



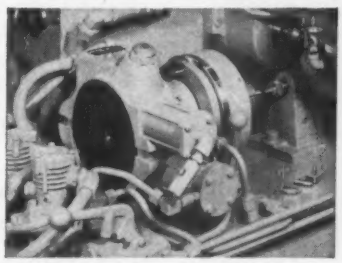
Automatic drilling of cross holes being done on Erickson Model 400 Speed Indexer with air cylinder and Expanding Drawbar Mandrel. Indexer equipped with interlock limit switches.



Angular drilling in jet part held in air operated collet chuck on Erickson indexer operating automatically. Entire fixture designed and built by Erickson.



Using end-clamping for half bearing, machine mills 8 oil grooves then skip indexes back to starting position for next part.



Milling four and six flats on needle valve part. Owing to size, part is placed in tail stock head-first, and tail stock then positions it in chuck and retracts.

ERICKSON TOOL COMPANY

34352 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
• AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS
• EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through)
• EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES (including gear-holding)
• BORING BARS • SPADE DRILLS • RECESSING TOOLS

ONE...
just set the part on the anvil (no masters or set gages needed)

TWO...
turn the knob to lower spindle (stops automatically on contact)

THREE...
read the measurement directly from the scale (and save up to 85% in gaging time!)

MEASURE TO .0001"!

... that's how quick and easy it is with the Bausch & Lomb DR-25B Optical Gage!

Takes just seconds to get direct readings to .0001"... depth, thickness, height, diameter, taper. You read in "tenths" from 0" to 3" on a bright, magnified scale... with such extreme accuracy (0.000025") that you use this DR-25B instead of gage blocks. Specially calibrated to normal shop temperatures with easy conversion charts for any temperature fluctuation. Here's today's fastest, easiest way to get highest accuracy readings... with job-proved savings of as much as 85% in gaging time... for only $875!
See it, compare it, in a free on-the-job demonstration.

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Oil Mist Precipitator Furnished In 300, 600, 1200-cfm Capacities

The Trion OMP, available in three sizes, is completely self-contained, requiring only electrical connections and ductwork. Designed to remove smoke and oil mist from machining and grinding operations and discharging cleansed air into the shop, it may be mounted on the grinding machine or remotely located. Integrated blower is adjustable to output requirements and is capable of handling long runs of duct.

Power pack incorporates selenium pencils and dc capacitors. A circuit regulator provides built-in protection against overload of components and automatic compensation for 120-ac line voltage variations.

Trion Inc, McKees Rocks, Pa

MORE DATA? Circle 96, inside back cover

Torque Control Air Impact Wrench Has Built-In Torque Stop

The J-42T has a hydraulic mechanism which shuts off the tool when desired torque is reached. It has quick, easy adjustment for a range of 20 to 100 ft-lb, held within limits of 10%. The tool is rated at ⅜-in. nominal bolt size. Optional drives are the ½-in.-sq; the ⅝-in. sq; or the 7/16-in. hexagon external quick change chuck.

Rotor Tool Co, 26300 Lakeland Blvd, Cleveland, Ohio

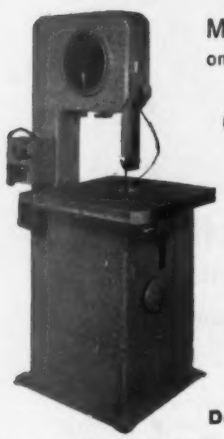
MORE DATA? Circle 97, inside back cover

Model 2612-2H

a DoALL PRODUCTIVITY-PLUS product

Now you can buy a 26″ DoALL machine with hydraulic table at a 50% saving in price over previously available models

Same throat capacity . . . same worktable features . . . coolant system . . . same cutting rates with Demon® HSS blades



Model 1612-U
only $995.00
(Base Machine)

Another DoALL bargain

—a multipurpose Utility machine with built-in DoALL quality and performance. Has 16″ throat and 12″ thickness capacity.

Uses new Dart® blades that outcut and outlast any other carbon steel blades—or your money back!

Ask for demonstration.

Everything about this new DoALL model 2612-2H band machine is almost identical to DoALL's famous 26″ Contourmatic® machine. Principal differences are in table size and elimination of certain hydraulic controls—*but the price is 50% lower!*

You get the hydraulically powered, infinitely variable feed table that tremendously multiplies your operator's productivity, lets him turn out more work with less effort, whether it's a one-of-a-kind job or production run.

You get the full 26″ throat capacity, the built-in coolant system, and all of the standard equipment, including one Demon high-speed-steel saw band that will deliver cutting rates up to 12 square inches per minute.

Here is a tremendous buy never before available in a genuine DoALL power feed machine of this size and capacity—and it has DoALL quality and performance through and through.

Get all the facts before you buy any vertical contour saw—call DoALL today.

THE DoALL COMPANY, Des Plaines, Illinois
Serving you locally through your DoALL Sales-Service Store

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CIRCLE 353 READER SERVICE CARD

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Surface Grinders

Power Saws

CUTTING TOOLS

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blowers
machine tools
materials handling
panelboards and switch boards
prime movers
pumps
compressors
general machinery

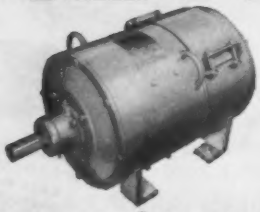
these Westinghouse products are tailored for you

On these pages are shown some of the many components developed and manufactured by Westinghouse specifically for OEMs. Here is one single source for technical assistance, manufacturing and stocking of all of your electrical needs. Use this *total* service to solve your design and manufacturing problems now. Call your local Westinghouse Sales Engineer or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96163-R

Westinghouse

NEW



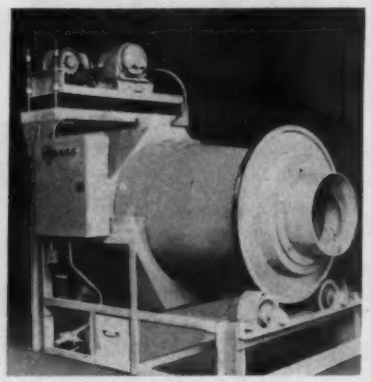
permanent magnet runout table motors

Improved performance, more torque per ampere, high temperature insulation. This watertight motor is designed specifically for starting, stopping, and reversing of rugged steel mill machinery and equipment. Epoxy insulation system provides full protection, highest resistance to corrosive agents and retains mechanical flexibility throughout its life. Write for Bulletin B-8247. Westinghouse Electric Corporation Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96179

Westinghouse

NEW SHOP EQUIPMENT



36-in. Automated Barrel Speeds Drying, Polishing of Metal Parts

Features of the Honite sawdust barrel include automatic controls of tumbling cycles, automatic separation and media retention, and automatic discharge of finished parts. Additional automation (optional) is afforded with a storage hopper and power loading equipment.

Drum is heated by gas. Parts are fed in one end and discharged at the other. The media remains in the barrel ready for re-use or can be discharged automatically. A magnetic separator, which is standard equipment, can be replaced by a vibratory separator employing interchangeable screens for drying and polishing nonferrous parts. The barrel is modified for normal tumbling operations. That model includes automatic rinsing and magnetic separation, if required.

Minnesota Mining & Mfg Co, 900 Bush Ave, St Paul 6, Minn

MORE DATA? Circle 98, inside back cover

Production Slide Table Has 5½-in. Table Travel

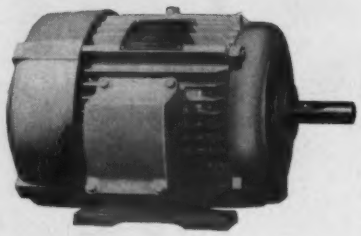
Unit can be quickly attached to milling machines, drillpresses, and other machine tools for production work. These tables are particularly useful for secondary operations in screw machine departments.

Size is 4 x 14 in.; T-slot, 7/16 in.; height, 1-13/16 in.; weight, 38 lb; base is 4 x 11½ in. long overall with 8 in. of dovetail.

Willhammer Machine Products, 801 McHenry Ave, Woodstock, Ill

MORE DATA? Circle 99, inside back cover

NEW



totally enclosed a-c motors

15% increased capacity, 80% to 100% longer life at rated loads. Totally enclosed motor with Class "B" insulation for greater performance life, lower maintenance under toughest conditions. Available as standard on 1 hp to 250 hp sizes in famous Life-Line "A" design. For information, write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96182

Westinghouse

NEW

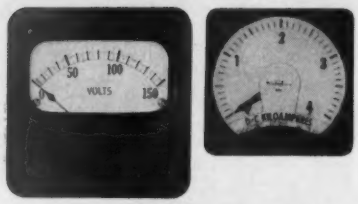
STATIC SLIPSYN synchronous motor control

No moving parts, precise synchronizing control up to 99% of synchronous speed. Static networks eliminate corrosion and wear failures. Positive adjustable pull out protection avoids false tripping. Static damper winding, field loss and incomplete starting sequencing protection available. For new or old motor control installations. For details, write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96186

Westinghouse

NEW

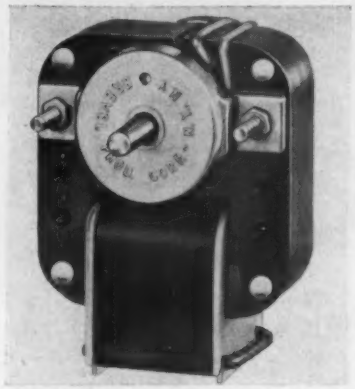


*tbt** switchboard instruments

No friction, higher sensitivity, infallible repeatability, unaffected by shock or vibration (can be shipped installed in equipment). These new Westinghouse K-241 and K-251 Taut Band Suspension instruments available in 4½″ full view 250° scale or 6″ rectangular 100° scale designs. Meet or exceed ASA Standard C-39.1. For sample of TBS and Bulletins 43-240 and 43-250, write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96181 *Trademark

Westinghouse



Small Motor Series Maintains Rotor Alignment Under Shock

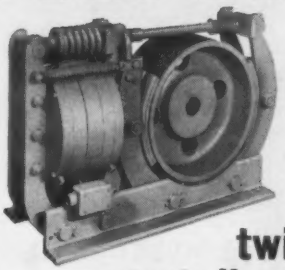
Die cast bearing brackets, with projections anchored in the field laminations, assure maintained rotor alignment during heavy shock in Series M shaded pole induction motors.

Used alone or as the backbone of a geared motor, the series is available in 4 stack thicknesses from 0.35 to 1.1 in. with maximum continuous duty torque ratings from 0.8 to 3-in.-oz at 120 v (1.3 to 11.5 in.-oz during intermittent duty). No-load speed is approximately 3350 rpm.

Brevel Products Corp, 601 W 26th St, New York 1, NY

MORE DATA? Circle 100, inside back cover

NEW



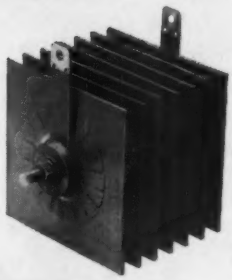
twin magnet direct current brake

For all applications that require fast stopping of the motor and load. Available in six wheel sizes, 8″ to 23″, meets all AISE standard dimension requirements. Uses twin magnet epoxy encapsulated coils, has six integrated compact sub-assemblies and requires only two easy adjustments for shoe wear and spring tension. Write for B-8248. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. *You can be sure . . . if it's Westinghouse.*

J96178

Westinghouse

NEW

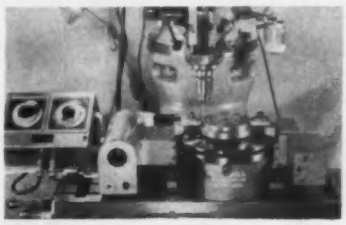


VOLTRAP* surge suppressor

Positive surge protection for silicon and germanium devices: Available in 16 ratings from 30 to 480 volts rms; clamping voltage range either 250% or 280% of rms voltage rating; 8 discharge ratings, 2 to 80 amps; polarized or non-polarized units. Write for TD 19-163. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96184 *Trademark

Westinghouse



Electronic Index Table Has Range of Applications

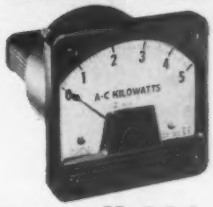
The M & M 800 Roto Mill is designed for automatic spacing of hole patterns in degrees, one-half degrees, or one-tenth degree increments. It can also be used for programming a part that requires milling of slots and, by use of a 15-in. program plate, can program uneven indexes.

Usable in a vertical or horizontal position, the table is designed for drilling, boring, jig boring, checking, milling, spacing, and many other applications. It is powered with a 110-v 60-c motor and a special slip clutch is provided for hand operation if needed.

M & M Tool & Mfg Co, 1124 E Third St, Dayton, Ohio

MORE DATA? Circle 101, inside back cover

NEW



economy K-221 *tbt** switchboard instruments

Famous TBS features, plus new economy. Lowest priced high quality switchboard instrument available today. Taut Band Suspension K-221 instruments offer permanent accuracy and are unaffected by shock or vibration (even shocks caused by shipping installed in equipment). Meets or exceeds ASA Standard C-39.1. For TBS sample and Bulletin 43.220, write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.* *Trademark

J-96183

Westinghouse

Westinghouse

McHenry Ave, Woodstock, Ill

MORE DATA? Circle 99, inside back cover

158 CIRCLE 354 READER SERVICE CARD

Westinghouse

CIRCLE 355 READER SERVICE CARD

NOW INTRODUCING THE . . .

JARVIS

Dril-King

No. 65 for Drilling • No. 66 for Drilling & Tapping

LOWEST PRICED AMERICAN MADE UNIVERSAL DRILLING & TAPPING MACHINE

Basic Drilling Machine Price Starts at Only $1195.00 (Less Spindle Assemblies)

Floor Type, Self-Contained Universal Joint Drilling & Tapping Machine.

Designed for Small Parts Production Where Small Hole Drilling and Tapping is Required.

12 Spindle Drivers, 4 Speed Selections. T Track Vertical Feed Work Table.

Capable of Standard Center Distances down to .390, closer upon specific application.

- Head remains stationary while counter balanced table feeds work pieces up to drills or taps.
- Rapid changeover from one job to another. Well suited for either short or long runs.
- Work table features 2 "T" tracks, has adjustable depth stops. Depth controlled either mechanically or electrically.
- Standard spindle assemblies can be arranged in jig bored cluster plates to your prints, or used with adjustable arms. Over 35 standard spindle assemblies available to fit any job.

Overall Height 66"
Height from floor to Work Table 39"

WRITE, PHONE OR SEND COUPON FOR FACTS AND FIGURES

Jarvis CORPORATION

Telephone Diamond 7-3321

Precision Pioneers For Years

JARVIS CORPORATION
26 Pease Ave., Middletown, Conn.

☐ Have Representative call
☐ Send "Dril-King" Brochure

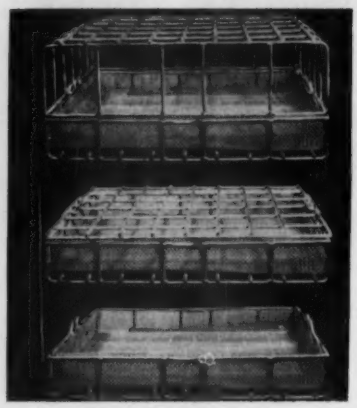
Name _____

Company _____

Street _____

City & State _____

NEW SHOP EQUIPMENT



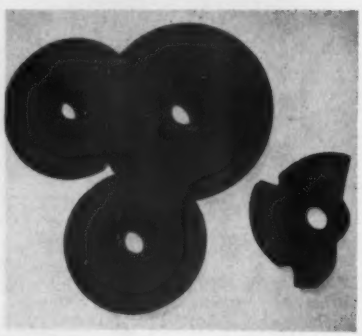
Heat Treat Basket Fixtures Support Multi-Shaped Pieces

Special grids for use with Ipsen's standard line of heat treat baskets are designed to hold long pieces or special-shaped material during heat treating operations. Baskets and fixtures are built to allow maximum heating or quenching rates for the material while permitting maximum net payloads in each charge. They are designed primarily for use in controlled atmosphere heat treat furnaces as well as vacuum heat treat units.

Height of the grid and size of the openings can be varied to fit customer requirements. Grid is anchored by using the stacking feature of the basket; a sleeve-like opening fits over the looped end pieces of the basket to prevent sliding in any direction.

Ipsen Industries Inc, PO Box 500, Rockford, Ill

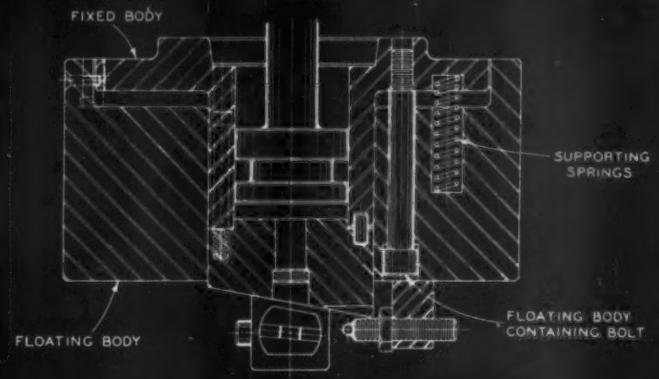
MORE DATA? Circle 102, inside back cover

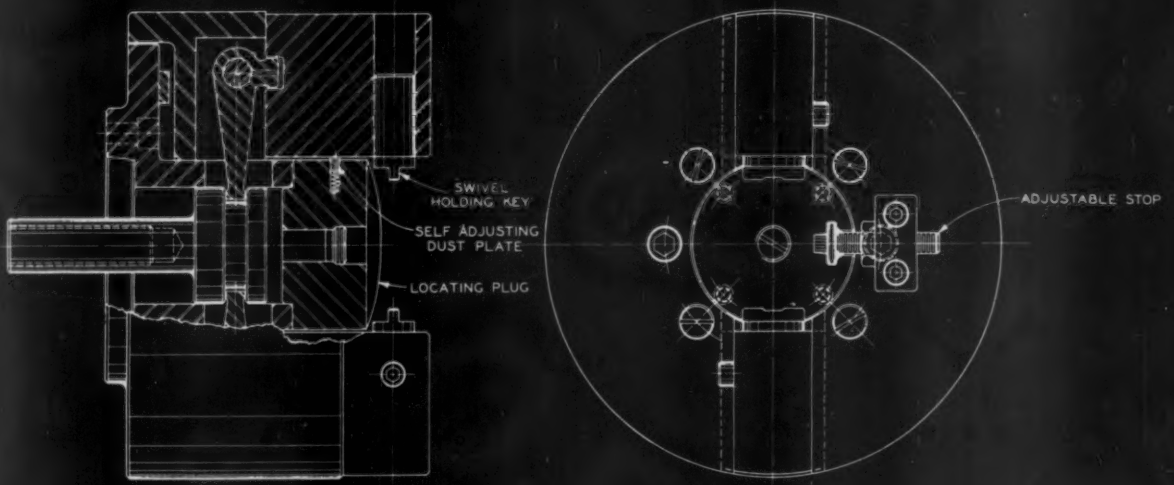


CAM BLANKS OF SYNTHANE laminated plastic are made specifically for Brown & Sharpe automatic screw machines. Offered for machines Nos. 00, 0, 4, and 6, the blanks are furnished turned to size, bored and with pin hole drilled. Radial layout lines assist cutting cams to the desired shape—*Synthane Corp, Oaks, Pa*

MORE DATA? Circle 103, inside back cover

Special CHUCKS

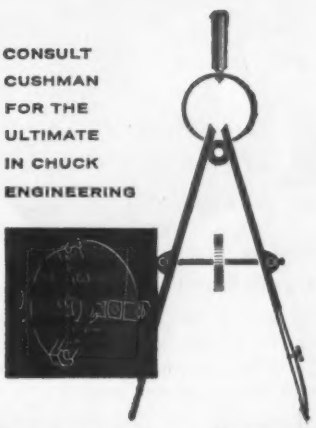




The assembly print reproduced above is but one of many examples of special chucks designed and engineered to meet most unusual work-holding and machining requirements. Cushman Special Chucks are being used in many diverse industries enabling manufacturers to meet realistic production quotas, maintain close tolerances, and achieve lowest costs on both short or long runs.

If you have a workholding problem, consult Cushman. Your problem may have already been solved.

CONSULT CUSHMAN FOR THE ULTIMATE IN CHUCK ENGINEERING

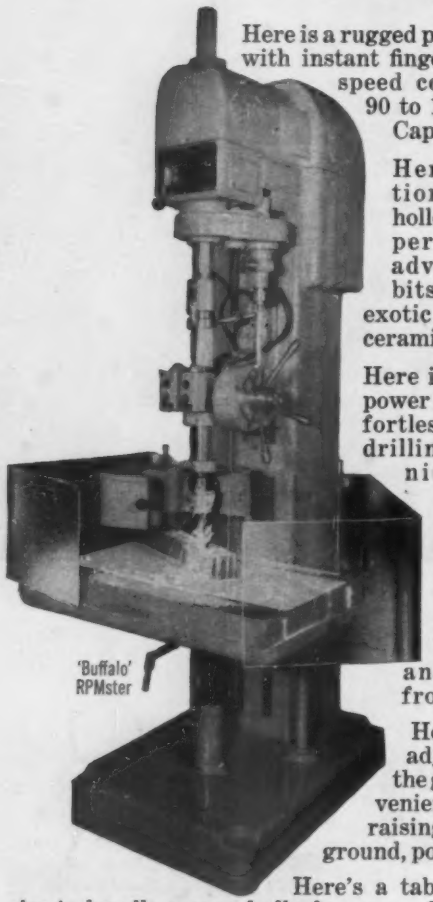


THE CUSHMAN CHUCK COMPANY • HARTFORD 2, CONNECTICUT

Manufacturers of Air and Manually Operated Chucks, Power Wrenches, and Face Plate Jaws.

Buffalo machine tools offer many advantages which enable you to reduce production costs. Here are four machines designed to expedite metalworking operations. Chances are one or more of them should be working for you right now!

Fight Rising Production Costs with 'Buffalo' Machine Tools



'Buffalo' RPMster

Here is a rugged precision drill with instant fingertip spindle speed control from 90 to 10,000 RPM. Capacities to 2".

Here's an optional special hollow spindle to permit use of advanced type bits in drilling exotic metals and ceramics.

Here is all-geared power feed for effortless, precision drilling. Here is nickel steel ball bearing backgearing to further increase your range of operations and freedom from troubles.

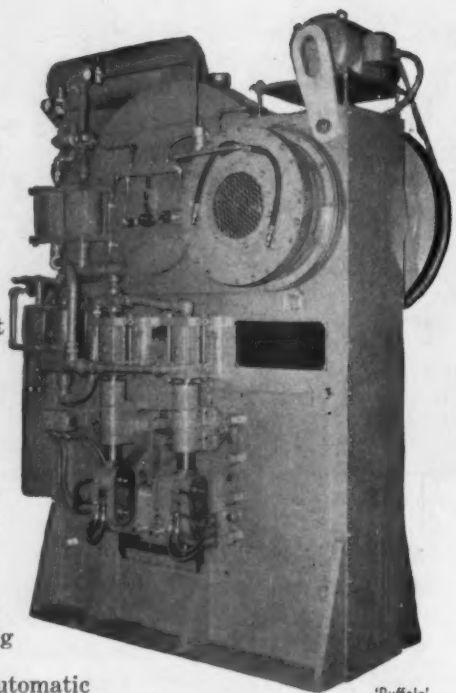
Here are setup adjustments of the greatest convenience — table raising screws and ground, polished ways.

Here's a table of ample size to handle any and all of your work.

In short, here's one machine of a complete line that's ready, willing and able to do more drilling jobs better and for less — to put you out front in the race against costs!

Have your 'Buffalo' Machine Tool Dealer fill you in on all the details.

Faster Cleaner Billet Shearing Than Ever Before!



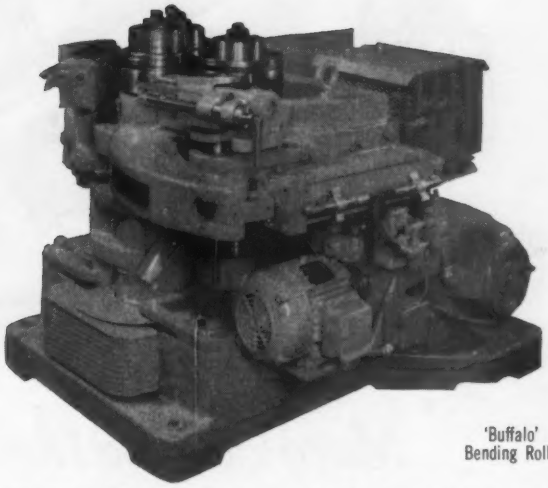
'Buffalo' Billet Shear

You get clean, square-cut billets for the best possible finished forgings — and at lower cost — per-cut with new 'Buffalo' Billet Shear. By automating with an optional automatic feed table on the No. 400, you can have up to 18,000 cuts per 8-hour shift.

These shear-fractured cuts have no smears to conceal porosity, as with sawing or burning. Quality control is greatly enhanced.

'Buffalo' Billet Shears have frames of heavy alloy plate. Lubrication is by trouble-free automatic pneumatic oiling system. Controls are electrical.

Your 'Buffalo' Machine Tool Dealer will be happy to give you full details, including capacities. Or write us direct.



'Buffalo'
Bending Rolls

Continuous Cold-Bending Without Dies!

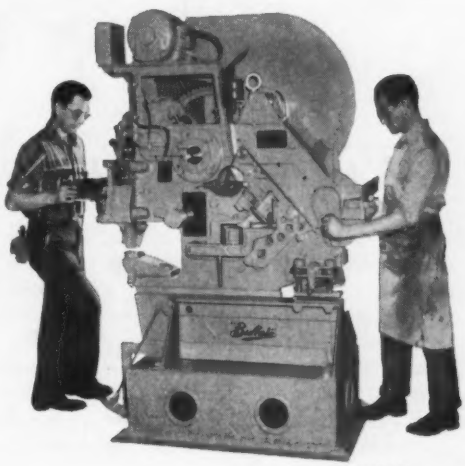
Here's high-speed, commercially accurate bending of tees, angles, beams, flats, pipe and tubing into arcs, segments and spirals. One pass does the trick. No heat, no dies required — it's all done by standard or special rolls to fit any structurals you wish to bend. Rings formed at production speeds by rolling spirals, cutting to length and butt-welding.

'Buffalo' Bending Rolls are built for a lifetime of profitable metal bending . . . in sizes from the lightest Aircraft Types to models for bridge builders and other heavy fabricators. There is no cheaper way to bend structurals. Ask your nearby 'Buffalo' Machine Tool Dealer !

7 Fabrication Operations on One High-Speed Machine!

In the race against high fabrication costs, don't overlook the 'Buffalo' Universal Iron Worker, the most useful machine in the shop ! Taking only the floor space of one machine, it cuts — punches — shears — slits — copes — notches — miters — without tool changes ! The U. I. W. does two operations at once — handles your angles, tees, beams, channels and bars in jig time — pays off in maintenance and straight production work — in all your fabrication jobs ! No shop ever bought a U. I W. that didn't pay for itself in a few short months in all-around usefulness. Investigate the U. I. W. today for the lowest-cost method of handling any fabrication — maintenance jobs in the shortest possible time, in the smallest floor space !

Have your 'Buffalo' Machine Tool Man join you in your fight for greater profits. Phone or write today.



'Buffalo'
Universal Iron Worker

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

MACHINE TOOL DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

More Can Be Done

With Reed Cylindrical Dies!

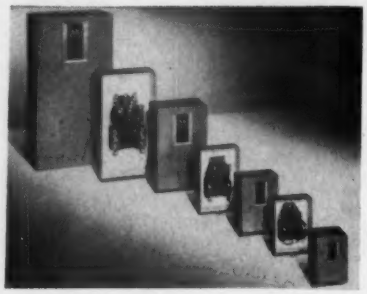
Reed thread and form rolling dies meet the widest range of applications — give you significant advantages with improved performance and reduced operating costs. Manufactured under the strictest standards of quality control, they're uniform . . . durable . . . accurate and available for two die or three die machines of all makes. Over 130 sizes regularly stocked . . . plus non-standard cylindrical dies on special order.

Let Reed, pioneer-leader in the development of all types of thread rolling equipment, help you get maximum production on all thread or form rolling jobs.

REED

ROLLED THREAD DIE CO.

Subsidiary of Union Twist Drill Company
HOLDEN, MASSACHUSETTS
Specialists in Thread and Form Rolling Tools and Equipment



Redesigned Allen-Bradley Motor Starters are Smaller, Lighter

Line of motor starters is offered in seven sizes with maximum ratings from 1½ hp 220v up through 200 hp, 440-550 volts. The new starters use the same "one moving part" solenoid principle found in other Allen-Bradley starters but have reduced weight and size. They also feature double-break contacts so shaped that they seat squarely upon closing; and totally enclosed arc chambers that confine the arc, limiting ionization and the resulting heat, and increasing current interrupting capacity. Magnetic blowout further increases the starter interrupting capacity and this magnetic design has two "working" pole faces—making it unusually powerful for its size and weight, according to the manufacturer.

Special attention has also been given to the coil to insure cool operation and it is set in a large die-cast aluminum mounting which acts as a heat sink. In addition the coils are molded under high pressure so that wires are held rigidly in place and cannot be moved by magnetic forces.

Solder pot overload relays are also redesigned to be tamperproof. With the motor running at normal temperature, pressing the reset button will not cause the starter to drop out, and after the relay has tripped as a result of overheat, the motor cannot be started by pressing the reset button until the motor has cooled down.

Allen Bradley Co, 136 West Greenfield Ave, Milwaukee 4, Wisc

MORE DATA? Circle 104, inside back cover

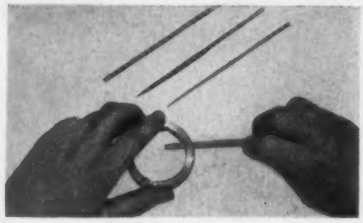
Electrostatic Hand Spray Gun Offered in 2-lb 6-oz Model

The Static-Rod will coat odd shapes including recesses, corners, and lips reportedly at rates as fast or faster than conventional spray guns. Push-button fan adjustment permits the operator to change from a fan spray pattern to a cone and back again with his gun hand. Unit uses some compressed air to help atomize and to direct the paint into recessed

areas. Amount of air can be varied to carry paint particles into very difficult areas and to produce extra-high speed.

Eclipse Air Brush Co, 390 Park Ave, Newark 7, NJ

MORE DATA? Circle 105, inside back cover



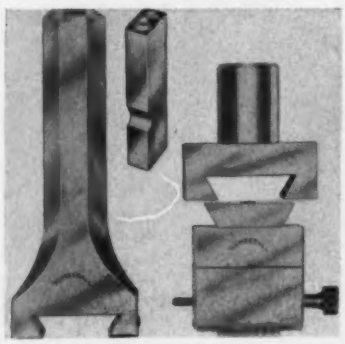
Line of Diamond Needle Files Furnished in 12 Shapes

These files are particuarly well suited to sharpening, cutting, and dressing hardened steel dies, carbide, ceramic, and other super-hard materials; they are also highly useful in dressing hard nitrided dies for extruding aluminum.

Files are furnished in 12 different shapes in the conventional hand file design, also as slot files or machine files. They are available mounted on a mandrel for use on hand filing machines. Three grits are offered: 200/240, fine, for polishing; 120/160, medium, for general utility use; and 80/100, coarse, for more rapid material removal. Diamond grains are permanently bonded to file steel blanks by Chrome-Loked diamond bonding process.

Titan Tool Supply Co, 68 Comet Ave, Box B, Buffalo 16, NY

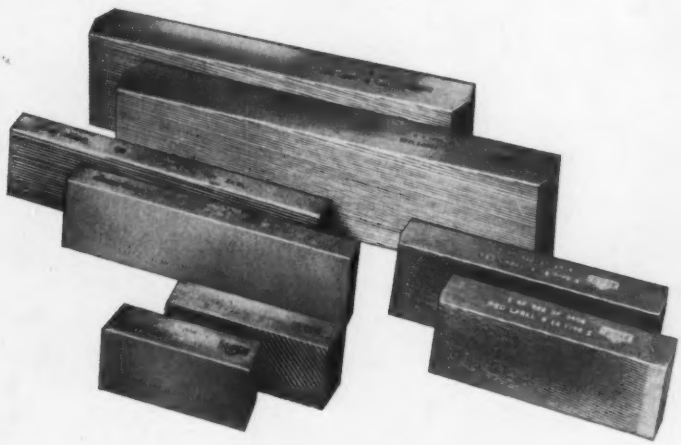
MORE DATA? Circle 106, inside back cover



TYPEHOLDER with dovetail adapters that allow speedy changes without disturbing setups can convert from press to hand stamping in seconds. Pin holds type securely, without screws or springs—*Numberall Stamp & Tool Co, Huguenot Park, Staten Island 12, NY*

MORE DATA? Circle 107, inside back cover

More Can Be Done



With Reed Flat Dies!

Reed, working closely with the fastener industry to broaden the application of thread and form rolling, precision-engineers its "Red Label" Flat Dies to produce products that are of superior quality, accuracy and uniformity. These include wood, machine, lag and tapping screws or knurling made on all types of reciprocating thread rolling machines.

Reed Flat Dies of selected steel are carefully heat treated to insure maximum life and are thoroughly inspected to meet rigid standards of quality control. As the pioneer-leader in the development of all types of thread and form rolling equipment, Reed can supply over 300 types and sizes of Flat Dies from stock for a wide variety of applications. Special dies on order.

REED

REED ROLLED THREAD DIE CO.

Subsidiary of Union Twist Drill Company
HOLDEN, MASSACHUSETTS
Specialists in Thread and Form Rolling Tools and Equipment

ONLY J&L MAKES COLD FINISHED WIDE FLATS THAT ARE "MACHINE-SHOP PERFECT"

BECAUSE ONLY J&L COLD ROLLS FIRST, THEN DUPLEX MILLS THE EDGES.

J&L cold finished wide flats (six inches and up) are cold rolled and leveled—*then* the edges are duplex milled. Result? Wide flats with precise and uniform tolerances from bar to bar. Edges that are perfectly square and true.

Only J&L produces tool-and-die quality, "machine-shop perfect" wide flats. Operators depend on them for stripper and bed plates, dies, jigs, fixtures and machine cams that are accurate and uniform, require less machining.

These prepared, machined flats are readily available from your local Steel Service Center in widths up to 14⅝" and in thicknesses from ⅛" to 2½".

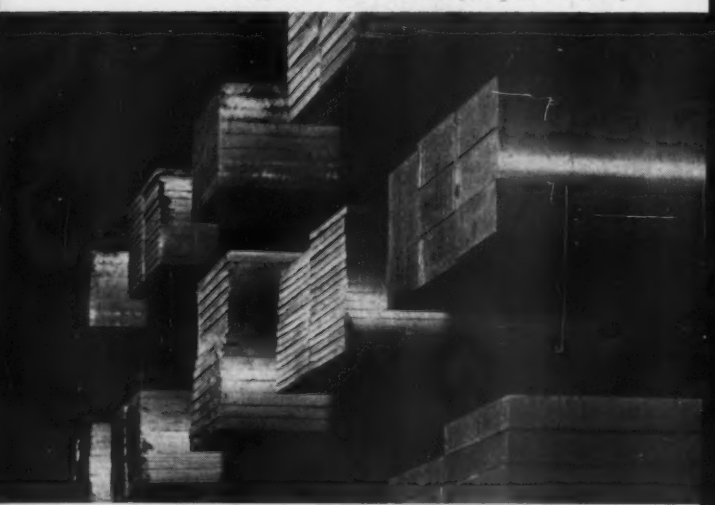
J&L STEEL

Jones & Laughlin Steel Corporation

3 GATEWAY CENTER, PITTSBURGH 30, PENNSYLVANIA

Where cold finished steel bars originated in 1859

Your Steel Service Center stocks J&L Wide Flats as standard items for quick delivery.

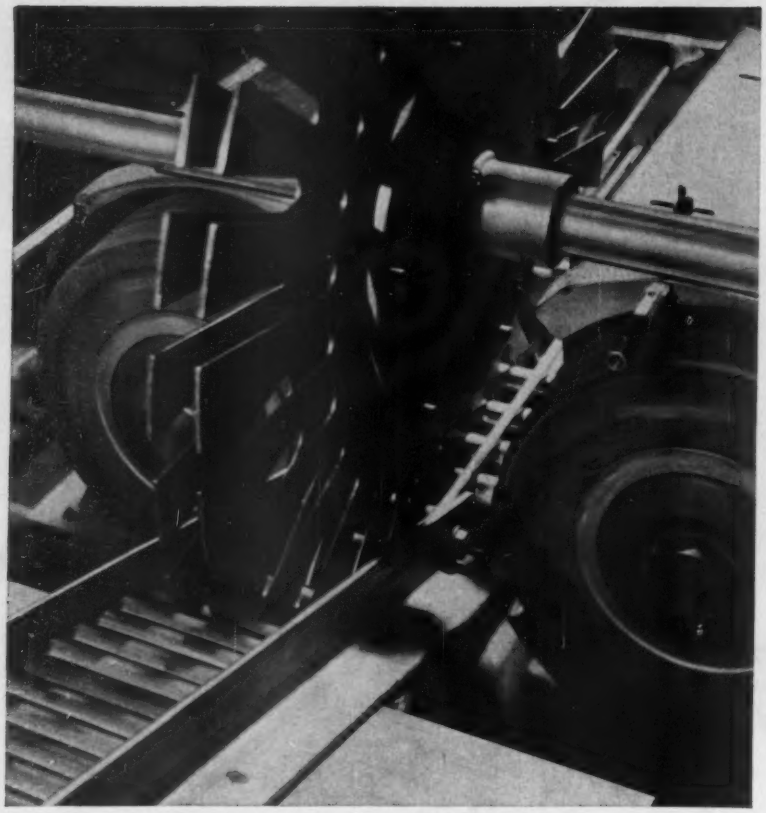


J&L Wide Flats are duplex milled after rolling to give you uniformly square edges that reduce or eliminate further machining.

Steel

Steel's Symbol of strength, long life, and economy.

CIRCLE 365 READER SERVICE CARD



SPECIAL POWER BRUSHING MACHINE at Kenmore Machine Products, Inc., Lyons, New York—uses "Ferris wheel" arrangement to index copper tubes past two Osborn 10" TY® brushing heads for deburring and edge-blending. Tubes are rotated through brushing cycle by endless belts. Machine is adjustable for various tube lengths and diameters. Rate for average 1" dia. part: 3300 pieces per hour.

SAVES $20,000 per year

deburring tubing with OSBORN power brushing

Before: this manufacturer of refrigeration components was using off-hand methods to remove end-burrs from rough cut-off lengths of copper tubing. Production was too slow . . . too costly.

Now: this specially-built automatic machine—equipped with Osborn TY® Master® Wheel power brushes—deburrs the tubes quickly, economically . . . edge-blends the tube ends smoothly, uniformly. *Production is over 8 times faster.* Consistently higher quality has eliminated the 100% inspection formerly required . . . *with total savings about $20,000 per year.*

If you are interested in boosting output . . . improving quality . . . reducing costs on *your* metal finishing jobs of every type—deburring, cleaning, polishing, precision blending—an **O**sborn **B**rushing **A**nalysis can show you how. No cost or obligation. Write or call *The Osborn Manufacturing Company, Dept. C-115, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

OSBORN

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery

NEW SHOP EQUIPMENT

New Drive Models Added to Electronic Control Systems

Two new variable speed integral horsepower drive models have been added to Servospeed's line of electronic control systems. Models are 5-hp electronic drive systems designed specifically for 440-v 60-c operation and are supplied complete with 2400 rpm base speed torque throughout the entire speed range and speed regulation is within 2% of set speed over all ranges.

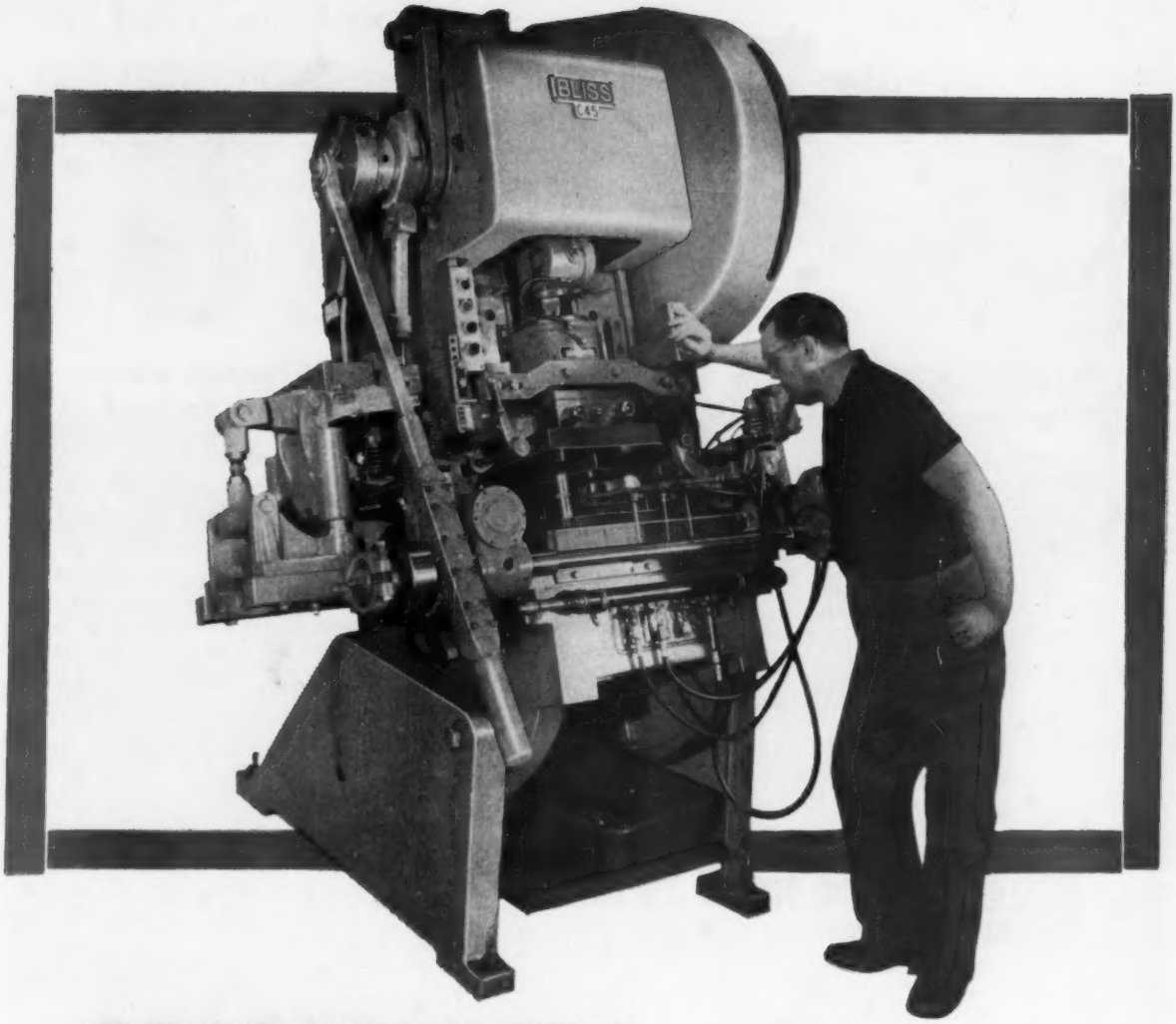
These units are available with various options for uni-directional or bi-directional operation and may be provided with speed indicating tachometer systems, load indicating meters, and various special features to meet requirements.

Electro-Devices Inc, Servospeed Div, PO Box 2308, Paterson 23, NJ

MORE DATA? Circle 108, inside back cover

LOCKSHER CUSTOM CARBIDE CUTTERS are made to fit all standard size arbor from 1 to 2 in. Custom features include any angle, any radius, or any width from 3/8 in. to 1½ in. Tolerance of the cutters is 0.001 in. on width and 0.001 in. on diameter. All cutters have a zero rake angle and can cut at 30 ipm at 150 rpm with a 0.010 hp-load. Horsepower requirements are said to be half that normally required. *—Locksher, 294 Eastwood Blvd., Centereach, New York*

MORE DATA? Circle 109, inside back cover



PRODUCTIVITY... that raises output 100% or more with new Bliss Big "C" inclinables

Raw strength and precision manufacture combine to make Bliss' new Big "C" Series presses the most productive inclinables ever built. How? Because the massive strength of the frame keeps deflection to the barest minimum. And because all of the moving parts are hand-fitted to tool makers' tolerances, making higher speeds practical.

Here's a case in point: Victor Adding Machine Co., Chicago, Ill., uses three new Bliss C-45's for heavy-duty blanking work on parts for the famous Victor Automatic Printing Calculator. Equipped with Bliss CK air-friction clutches, the C-45's have automatic feeds and variable speed drives. Result: yield of stampings has gone up as much as 114%, depending on the part, over that of previous presses. It's no wonder that Victor Adding Machine now has fourteen Bliss Big "C" inclinables in service.

There is many another "plus" in these new presses...advantages like extra die space... large openings in bed and frame...precision-forged crankshafts...compact combination controls...semi- or fully-automatic lubrication...bronze ball seats...lamina bronze gibs...mechanical or air clutches ...geared or non-geared models...powered unsticking device. There's a lot more information about Bliss Big "C" inclinables in our new color catalog. Why not write for your copy today?

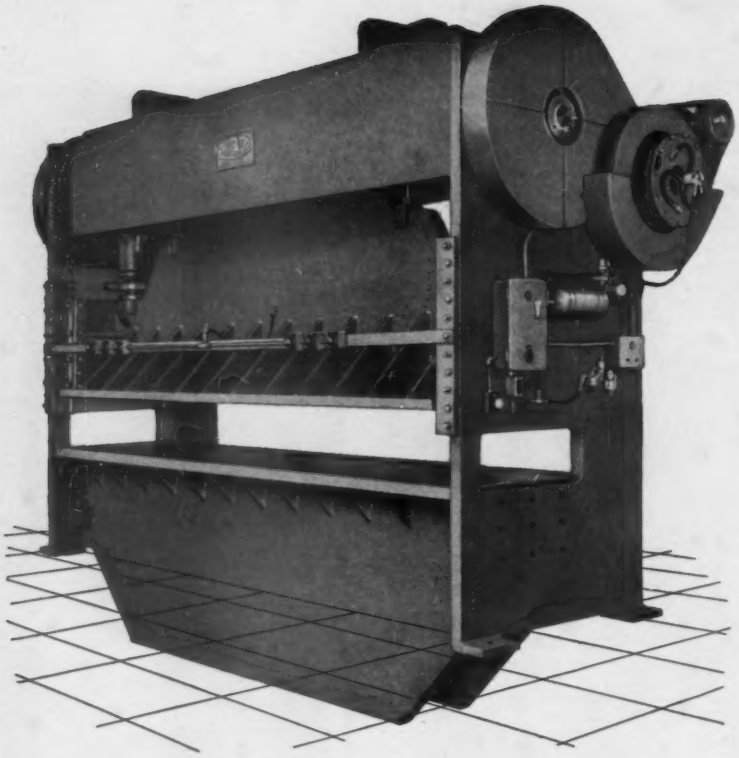
BLISS is more than a name...it's a guarantee

E. W. BLISS COMPANY • Press Division • Hastings, Mich.

Foreign Subsidiaries: E. W. Bliss (Canada) Ltd.; E. W. Bliss (England) Ltd.; E. W. Bliss Co. (Paris) France; E. W. Bliss-Henschel G. m. b. H., Düsseldorf, West Germany

BLISS SINCE 1857

PRESSES • ROLLING MILLS • ROLLS • CONTAINER MACHINERY • CONTRACT MFG. • PUBLIC SAFETY



CHICAGO DREIS & KRUMP

PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

8674

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.
7434 South Loomis Boulevard, Chicago 36, Illinois

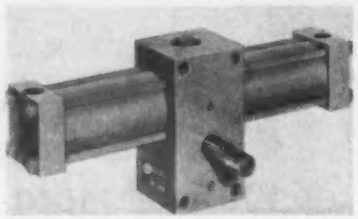
Vertical Pneumatic Grinders Offered in Two New Series

Low-profile lightweight portable units for cup wheel and depressed-center wheel grinding and sanding and wire brushing work are available in straight or lever throttle models for up to 6-in. cup wheels and 9-in. depressed-center wheels.

Series 907 heavy-duty models are furnished in a choice of speeds from 3100 to 9000 rpm. Series 908 extra-heavy-duty units have speeds from 3100 to 6000 rpm. Features of these grinders include direct-acting governors to maintain accurate speed, heavy-duty bearings, 4-bladed swastika-type motors, and hardened, ground, and honed cylinders.

Thomas C Wilson Inc, 21-11 44th Ave, Long Island City 1, NY

MORE DATA? Circle 110, inside back cover



Constant Torque Rotary Actuator Develops 314 in.-lb of Torque

Air-Dex is a reversible rotary actuator driven by air or hydraulic fluid pressure. Two opposing pistons move a gear rack over a pinion on a drive shaft for any desired rotation up to 360°. Rotation of the shaft may be stopped and reversed at any part of the cycle.

Three models are offered, developing 50 to 314 in.-lb of torque with 100-psi pressure. The drive shaft is keyed for use with stock worm or spur gears or special cam or lever attachments. Functions include power steering, gate operation, indexing, tool positioning, and azimuth control.

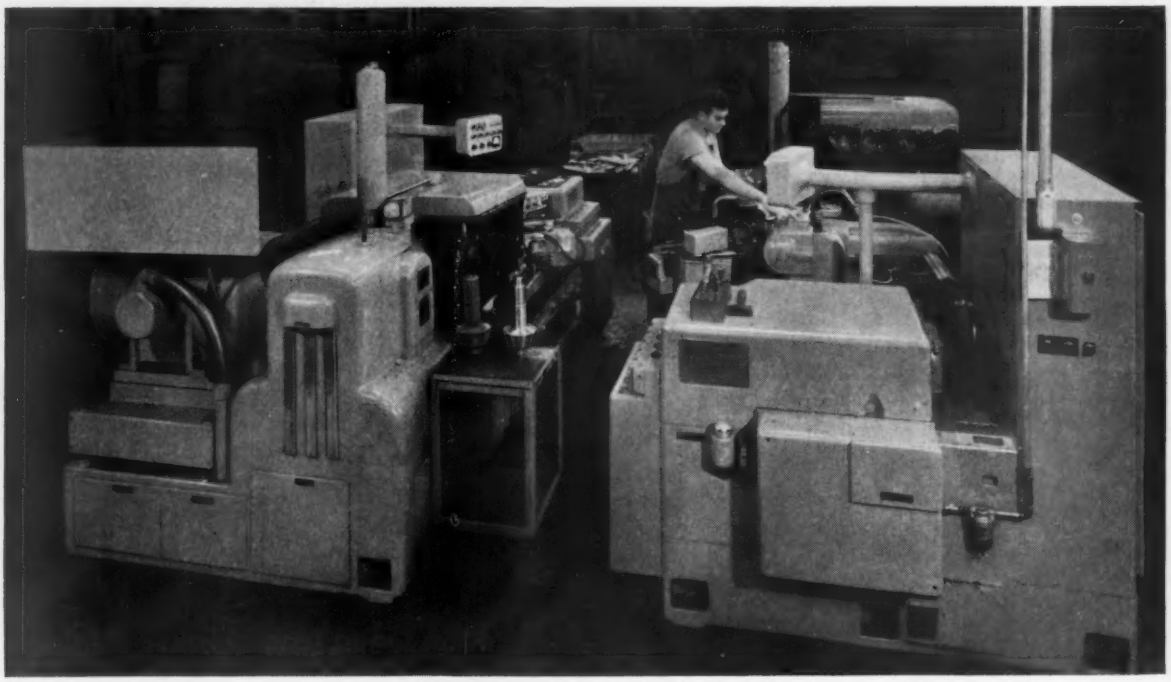
Mo-Bar Hydraulics Co, Crystal Lake, Ill

MORE DATA? Circle 111, inside back cover

Reduce costs with multi-cycle turning on Monarch 21-H Mona-Matic production Lathes

...get greater accuracy and versatility as a bonus!

The two Model 21-H Mona-Matics shown below are turning bevel drive pinions. They replaced four outdated production lathes. In the same plant, on the steering knuckle line, two additional Mona-Matics replaced six old profit-stealers.



Cost reduction, based on the Mona-Matic method, stems from these user benefits.

- **Increased Output.** Automatic multi-cut turning cycle; one man easily operates two machines.
- **Less Setup Time.** Template controlled, single point, running tool permits setup often in less than thirty minutes; tool change in several minutes.
- **Lower Tooling Costs.** Standard cutting tools used; no expensive forming tools or multiple tool setups.
- **Greater Accuracy.** "Air-Gage Tracer" template control eliminates human element; minimizes work deflection.
- **Time Saved on Succeeding Operations.** Grinding and polishing often eliminated; thread rolling sometimes accomplished during cycle.

The Model 21-H Mona-Matic is a powerful, dependable, production lathe backed by all the accumulated know-how of Monarch engineers. Why not ask us to prove its merits on *your parts*. Write THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio.

Monarch
TURNING MACHINES

ASK ABOUT THE MONARCH DEFERRED PAYMENT AND TOOL LEASE PLANS

American Machinist / *Metalworking Manufacturing*

Announces the publication of an important and significant special report

"How to

PROVE THE PROFIT

in Numerical Control"

The principal editorial feature of the October 30, 1961 issue

NUMERICAL CONTROL COME

NUMERICAL CONTROL HAS COME OF AGE—Today, numerically controlled equipment is proving itself practical in many actual in-plant applications. Much has been written about numerical control since it was first introduced. Thousands of pages have been published to explain N/C techniques, developments, and new applications. The first article on N/C in a metalworking publication was an American Machinist Special Report in 1954, "Numerical Control, What It Means to Metalworking." American Machinist/Metalworking Manufacturing probably has published more on N/C than any other magazine.
Now there is a new need to be satisfied.

Numerical-control equipment represents a substantial capital investment. In spite of numerous satisfied users, and many obvious cost savings inherent in this control concept, many specific questions about its purchase and employment in manufacturing are puzzling potential purchasers:

1. How do we justify the initial cost?
2. How soon will N/C pay off?
3. Is labor cost the major saving?
4. Does N/C fit our production?
5. What types of equipment are available with N/C?
6. What machine tools and systems are in practical production?
7. How long can I avoid buying N/C equipment?
8. What are the characteristics of different N/C systems?

American Machinist/Metalworking Manufacturing will devote the major portion of the editorial content of its *October 30, 1961 issue* to answering these and related questions. This report, the first such in-depth effort on the part of any publication, will give the readers sound economic justification for the purchase and employment of numerical control. And it will prove success by example. Such business journalism is possible only with the editorial and technical resources of AM/MM.

This factual, easy-to-use 32-page compilation will consist of two major sections:

1. How to select numerically controlled equipment, and
2. How to justify your investment in numerical control.

I. Selection of numerically controlled equipment will consider such topics as:

A. How to review existing manufacturing facilities.
B. How the product-line influences manufacturing requirements.
C. Special machines as a limiting factor in design change.
D. Can construction costs be avoided by eliminating equipment?
E. How much numerical control is needed for effective use?

S OF AGE

An important part of this section will be a comprehensive fold-out presentation of technical characteristics and operational data, plus applications, for most of the numerically controlled machine tools and numerical-control systems currently available. This much comparative detail is not presently available in any form.

II. Economic justification of numerically controlled equipment will discuss:

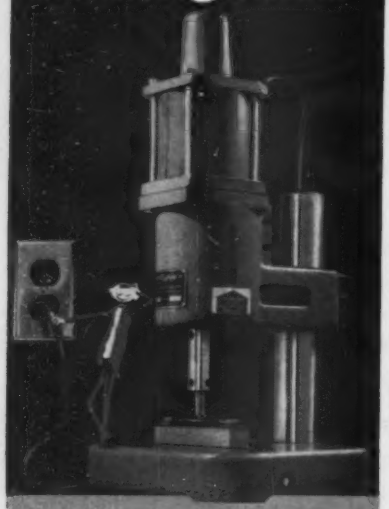
A. The influence of numerical control on the *total plant economy*.
B. The problem of evaluating intangible benefits.
C. Analysis of each of the major areas of savings with N/C. Tooling, lead time, inventory, floor space, labor, scrap, etc.
D. How to develop useful cost data.
E. How numerical control differs from conventional manufacturing methods.
F. How equipment investment formulas can be helpful.
G. How to finance the purchase.

Outlining sources of funds, including the latest information on conditional sales methods and leasing programs. Discussing the proposition that possession, not ownership, produces the profit. To illustrate by example, this section will contain a substantial number of case histories of numerically controlled machines proving themselves in production.

At this time, when so many manufacturing men are beginning to recognize, and evaluate, this dynamic change in their business lives, this issue of AM/MM should have considerable impact.

You can solve all your staking problems for just $148 with the NEW portable, all electric

ELECTROSTAKE



BLACK & WEBSTER
INC.
570 PLEASANT STREET,
WATERTOWN 72, MASS.

Gentlemen:

Please send me information about the Series 4 Black and Webster Electrostake models F.J.S., B.S. & S.M.S. which:

1. stake up to 120 units per minute with controlled impact to 3500 lbs.
2. are easily movable from job to job
3. never need air lines
4. don't require skilled labor
5. set up easier and quicker
6. cut costs, time, labor

NAME

COMPANY

STREET

CITY ZONE STATE

DEPT. 4

NEW SHOP EQUIPMENT

Two Lightweight Lifting Magnets Designed for Steel Plate Jobs

Compact My-T-Mag units with lifting capacities of 1500 and 4500 lb are offered for use in mold and die plants and other metalworking operations. They contain a built-in rectifier which enables operation on any 110/120 v line, either ac or dc.

Heavy-duty switch has a spring-action release position which quickly demagnetizes and releases the load, and a light that indicates when the magnet is operating. As an added safety feature, the magnets are equipped with a 3-prong, twist-lock plug on an 18-in. cord and 10-ft extension cord. The 7-in.-dia magnet weighs 40 lb, the 12-in.-dia, 120 lb.

D-M-E Corp, 6686E McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 112, inside back cover

Portable Stock Feeder Converts Press Jobs to Automatic Feed

This automatic portable coil and strip feed unit converts any punch press, press brake and square shear job to high speed feed. The unit will feed strokes up to 12 in. with speed up to 350 strokes per minute in stock widths to 24 in., in light guage material. It will handle most materials up to 2½ lb per ft.

Stock feed can be from right to left, left to right or front to back and the machine will work as either a push or pull feeder. Stroke adjustment can be controlled to 0.002 in.

Power Control Products, Inc, Vicksburg, Mich

MORE DATA? Circle 113, inside back cover

high speed metal marking

precision marks up to 10,000 per hour

For marking drills, rods, and similar shaped work pieces, this Series 19 Model 562 Vertical Dial Roll Marking Machine is unsurpassed for capacity, ease of operation, quality of marking. Marks **permanently** indented impressions. Features include air loaded marking head, and universal carrier dial to accommodate parts from 1/16" to 1/2" diameter. Other models for every marking requirement.

Write for literature.

NOBLE & WESTBROOK MFG. CO.
17 Westbrook St., East Hartford 8, Conn.

Noblewest makes finest quality dies at competitive prices for all marking purposes.

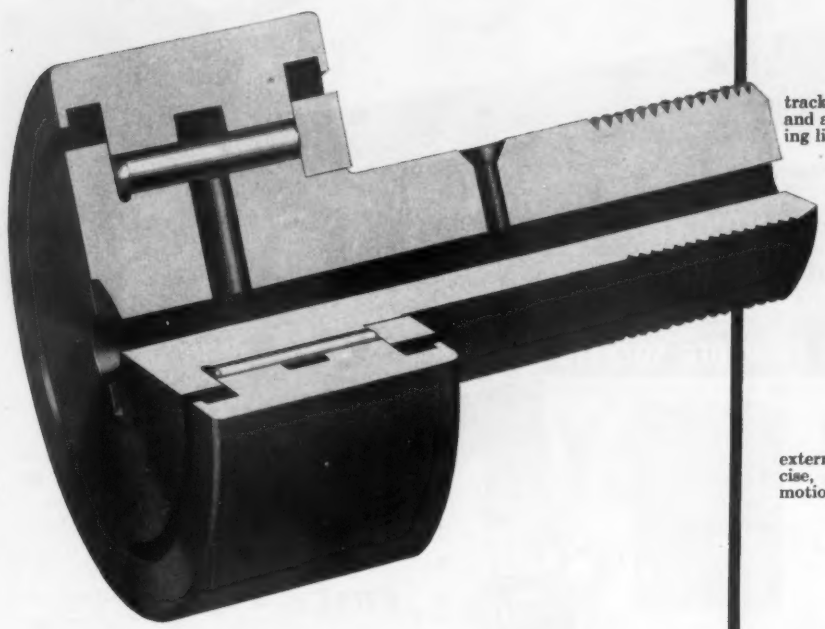
mark it best with
NOBLEWEST

McGILL®

CAMROL®

BEARINGS

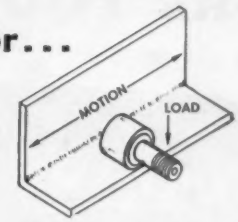
are ideal for these applications . . . outperform, last longer and cost less than improvised units



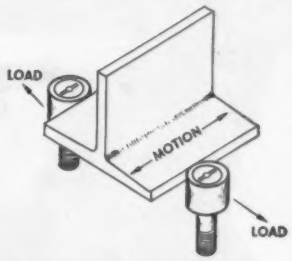
CF Series CAMROL bearings from stock eliminate the need for procurement and assembly of parts for "built-up" bolt, bearing and washer units. They also provide precision and uniformity of construction which assures accurate, trouble-free anti-friction performance. High capacity in small radial space (and the ability to withstand shock loading) are achieved through a full complement of rollers supporting a heavy outer race.

Stock sizes in roller diameters from ½" to 4" in CF series with integral stud and CYR series for shaft mounting. Available in all series with integral seals for lubricant retention and protection from contamination, and in a new heavy duty stud series.

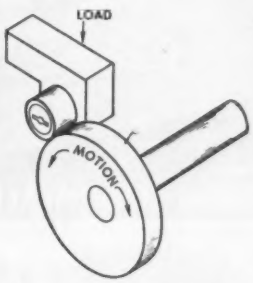
For . . .



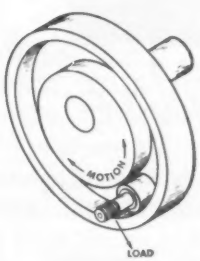
track or load support rollers to provide anti-friction linear motion



track guide rollers—to insure free and accurate lateral location during linear motion



external cam applications — precise, anti-friction translation of motion



internal cam applications

Send for Catalog No. 62 for complete information on McGill needle roller bearings.

CONSULT McGILL EARLY
IN YOUR PRODUCT R and D
specialized engineering saves time, improves design

McGILL MANUFACTURING CO., INC.
Bearing Division
300 N. Lafayette St., Valparaiso, Ind.

engineered electrical products
McGILL®
precision needle roller bearings

MORE TOOLPOWER than Sets Twice its size

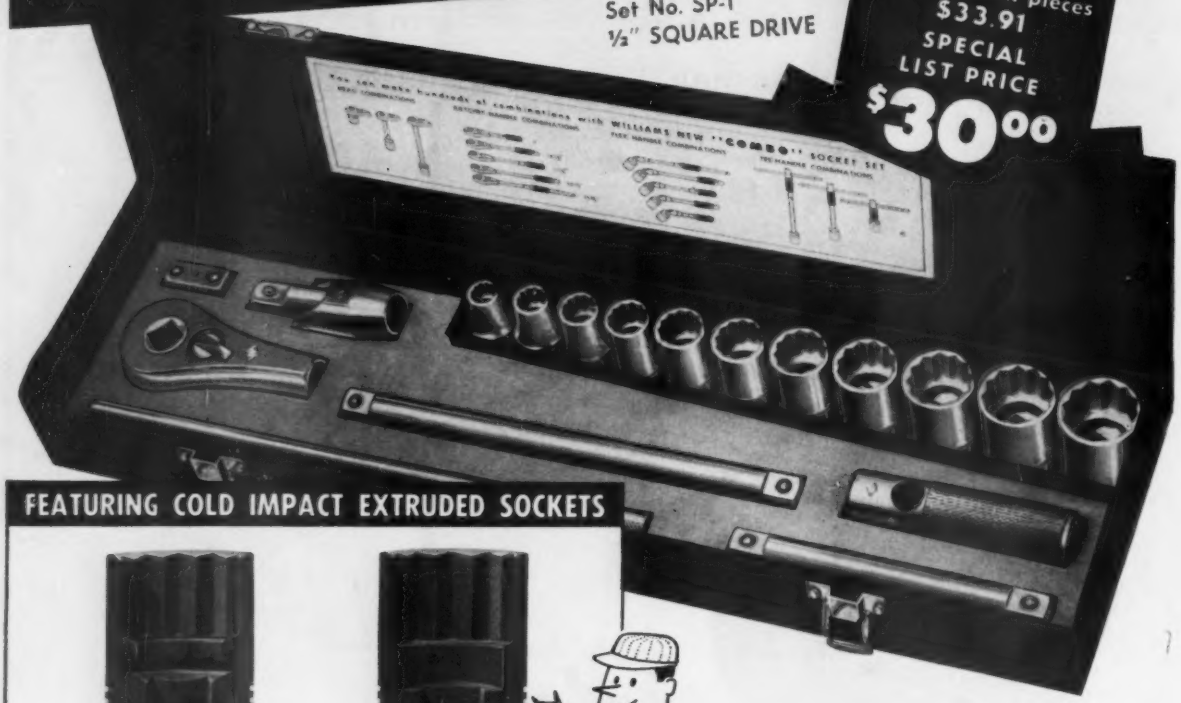
WILLIAMS

NEW COMBO SET

IDEAL FOR MAINTENANCE AND GENERAL REPAIRS

Set No. SP-1
½" SQUARE DRIVE

Total List Value of individual pieces $33.91
SPECIAL LIST PRICE
$30.00



FEATURING COLD IMPACT EXTRUDED SOCKETS

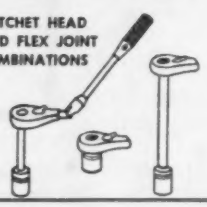
Cross section of conventional socket machined from bar stock and hot punched. Note undercut necessary for metal displacement by hot punching of double hex opening.

New impact extruded socket with closer tolerances has greater strength and longer life. Note the clean lines and lack of any undercut for metal displacement that comes with controlled metal displacement.

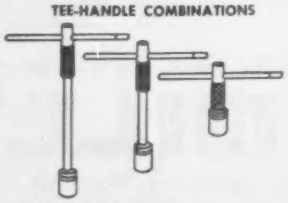
ONLY SEVEN DRIVER PARTS AND ELEVEN SOCKETS MAKE HUNDREDS OF QUICK-CHANGE DRIVER COMBINATIONS

FLEX HANDLE COMBINATIONS

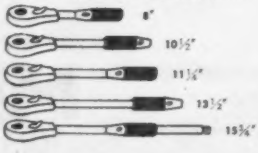
RATCHET HEAD AND FLEX JOINT COMBINATIONS



TEE-HANDLE COMBINATIONS



RATCHET HANDLE COMBINATIONS



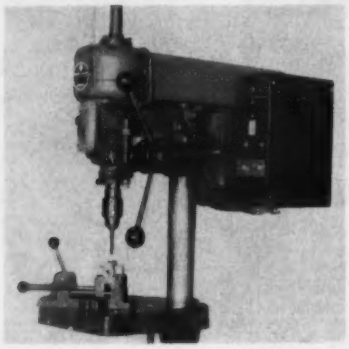
PRICE • QUALITY PERFORMANCE

. . . all describe the greatest Socket Set Value ever offered. Lightweight and compact, it is as handy for field use as on the shop bench. All parts are made of selected alloy steel, heat-treated and finished with heavy chrome-plating over nickel. Drive parts ½ inch square . . . sockets from ⅜" to 1". Ask your Distributor for Williams Combo Set No. SP-1.

J. H. WILLIAMS & CO.

DIVISION OF UNITED-GREENFIELD CORPORATION

408 VULCAN STREET BUFFALO 7, N. Y.



Attachment Converts Drillpress To Drilling, Tapping Combination

Consisting of an electrically interlocked reversing control panel which mounts on the right side of a drillpress head and a cam-operated hand feed wheel with switching control, this electronic tapping device will tap to the capacity of presses up to 2 hp. The unit makes possible the use of multiple spindle drill heads for multiple spindle tapping and will allow the use of the same fixtures for drilling and tapping.

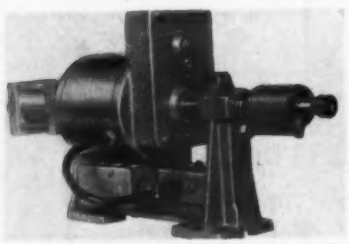
A standard drillpress with this unit attached becomes a tapper drillpress combination that can be used either way by throwing a toggle switch.

For high accuracy the machine has directional synchronization of vertical spindle travel and tap rotation. Also the hand wheel control simultaneously reverses the direction of the spindle feed and tap rotation.

Special high reversal motors for tapping cycles up to 50 per minute are available as accessories in ¾ hp, 1740 rpm, and 1 hp, 1140, or 1600 rpm.

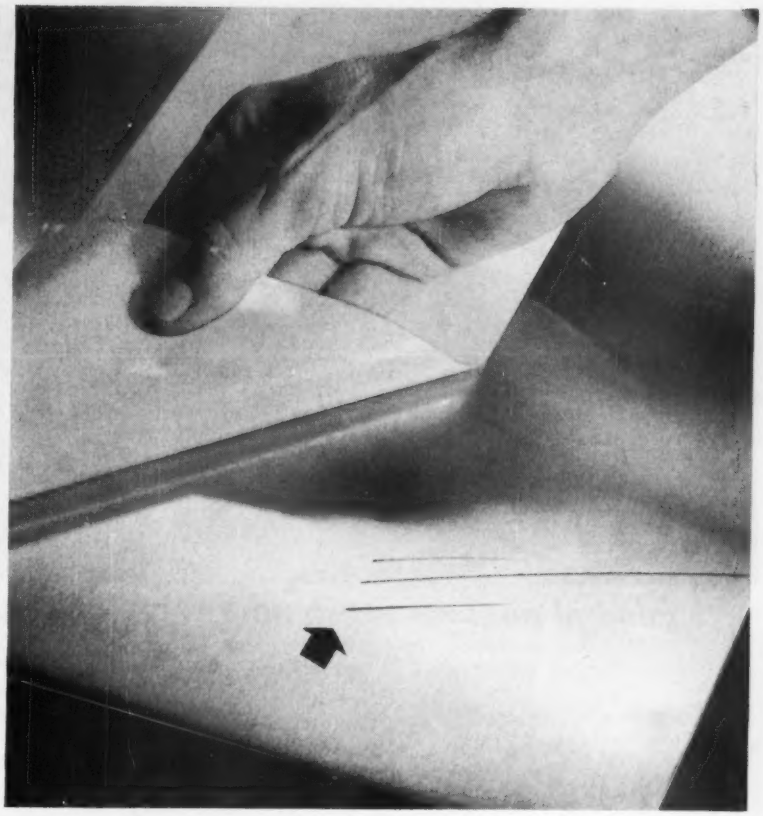
Power Control Products, Inc, Vicksburg, Mich

MORE DATA? Circle 114, inside back cover



SMALL AUTOMATIC TAPPING UNIT has a capacity range from No. 4-40 to No. 10. The spindle is driven by a single direction electric motor with reversing attachment. Tap speed is 750 to 3000 rpm in seven steps and feed is powered by an air cylinder—*The Electro Mechano Co, 241 East Erie St, Milwaukee, Wisc*

MORE DATA? Circle 115, inside back cover



Protect shiny surfaces from costly damage with

MYSTIK BRAND

6100-B PROTECTO-MASK®

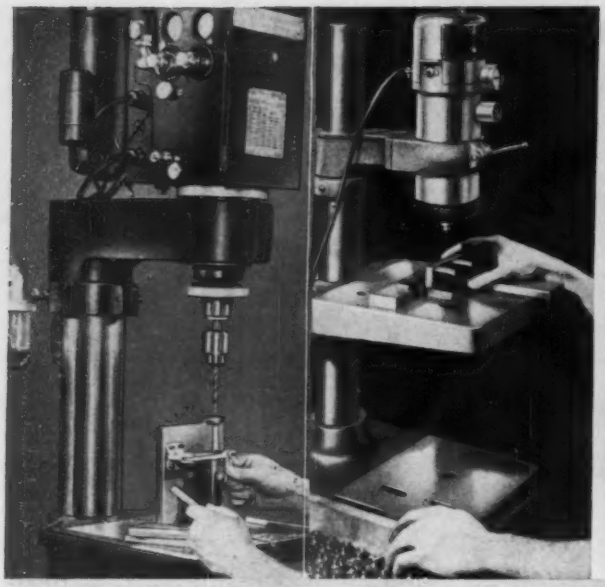
■ Half of the stainless steel sheet (shown in the above photo) was covered with Mystik Brand Protecto-Mask. The other half was left exposed. Notice how the uncovered half was scratched and marred. But the surface that was covered with Protecto-Mask is unblemished and gleams like new!

Now you can protect your polished or brightly plated materials from costly scratches, gouges, oil marks and blows. Protecto-Mask is a tough, self-sticking paper "skin" that is easily applied to any smooth surface. And it peels right off, as shown above, without leaving any residue.

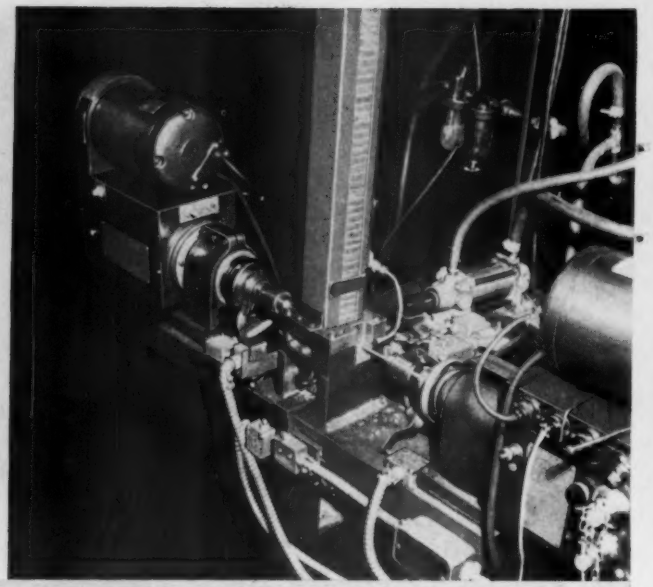
Find out how you can prevent damage to sheet stock before fabrication, or during assembly, stacking, storage and shipping with Protecto-Mask. It is available in a variety of grades for products that are to be drilled, sheared, sawed, sand blasted or welded. See how you can save man hours and reduce rejects and refinishing with Protecto-Mask. Write for detailed information today.

MYSTIK® TAPE SELF-STIK

MYSTIK ADHESIVE PRODUCTS, INC.
2635 N. KILDARE AVENUE • CHICAGO 39



general purpose machining
Use any Dumore Drilling Tool for a continuous job...tapping, drilling, etc....in one set-up.



automated set-up
Combine one or several Dumore Drilling Tools with automatic workpiece feeding and holding devices for specific operations.

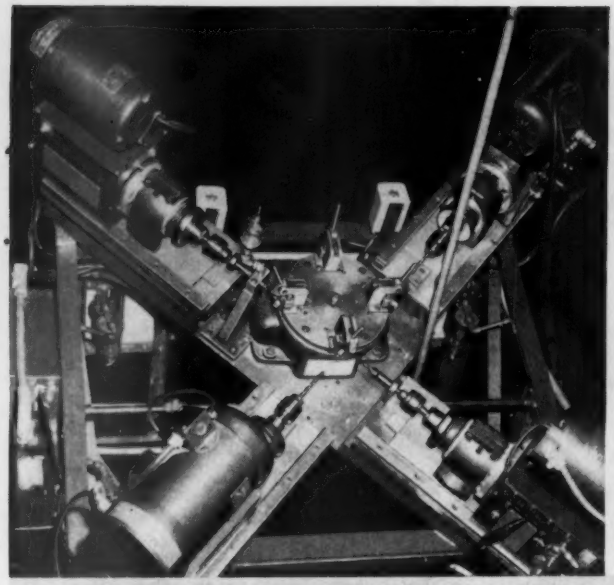
UNLIMITED MACHINING VERSATILITY

for holes from .001 to 3/8"

...1/2" TAPPING

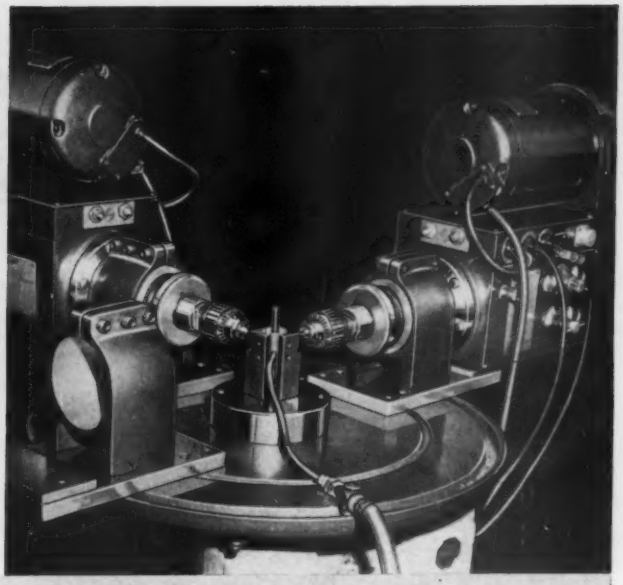
You can tap, drill, ream, chamfer, spotface, center, deburr and do related work in general purpose, automated set-up, multiple machining and changing set-ups...at lower cost.

YOUR DUMORE DISTRIBUTOR HAS COMPLETE STOCKS FOR FAST DELIVERY



multiple machining

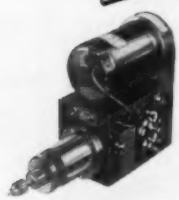
Combine several Dumore Drilling Tools in one set-up to perform several different operations, at the same time or in sequence.



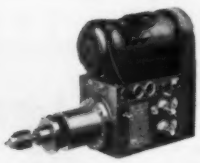
changing set-ups

Move the same Dumore Drilling Tool to several different set-ups to do specific jobs.

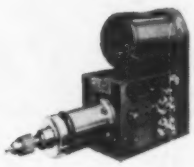
DUMORE® PORTABLE, PRECISION DRILLING and TAPPING TOOLS



"hi-speed" units
800 to 15,000 rpm speeds for holes from .020" to 1/4", 2 models. From **$665***



"drill-n-tap" units
Drills or taps automatically at the flip of a switch. Drilling No. 60 to 3/8", tapping 0-80 to 1/2-13. (in mild steel). From **$907.50***



drill units
Automatic drilling units. Built-in power and controls. 2 models. Drills No. 60 to 3/8" (in mild steel). From **$595***

drill heads
No. 80 to 5/32" drill capacity—built-in power for automatic operation. 2 models. From **$237.50***

micro-drill
Drills small holes from .001" without special operators. A miniature jig borer. **$625***

sensitive drill press
No. 80 to 1/8" drill capacity. Foot switch operation. **$102.50***

*FOB Racine

drill speeder
Converts standard drill press or lathe to high speed driller. Fits into chuck, supplies its own power. No. 80 to 1/8" capacity. **$47.50***

and Dumore engineered production tools and accessories including complete automatic drill presses and fixtures.

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THE DUMORE COMPANY
1329 Seventeenth Street, Racine, Wisconsin

HI-SPEED DRILL UNITS • DRILL-N-TAP UNITS • DRILL UNITS • DRILL HEADS • MICRO-DRILLS • DRILL GRINDERS • TOOL POST GRINDERS • HAND GRINDERS • FLEX-SHAFT TOOLS • QUILLS AND ACCESSORIES • VERSA-MIL UNITS

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When you have a need for erector-type components for special machines... machining heads, feed tables, machine beds... contact our subsidiary Master Manufacturing Company, Hutchinson, Kansas.

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NEW Snap-on

128-PAGE TOOL CATALOG

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Here is a complete, 128-page hand and power tool buying guide for purchasing agents, engineers, production and maintenance officials — anyone concerned with the use of hand tools for assembly, maintenance, field service and original equipment repair kits.

Every type and size of tool is identified by number for quick, easy ordering. Important dimensions and specifications are clearly listed. Popular sizes of sockets and attachments designed expressly for powered nut runner and impact wrench use are included.

Also included is a complete range of automotive tools and shop equipment for fleet maintenance operations.

Ask the SNAP-ON Sales Engineer who calls at your plant for your FREE copy. Or write direct.

FOR ALL INDUSTRY

SNAP-ON TOOLS

8025-128th AVENUE • KENOSHA, WISCONSIN

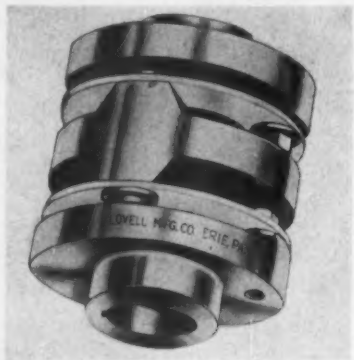
5-gal Ultrasonic Cleaner Develops Output of 4000 W at 20 KC

Cavitator 20/40, operating from a 5-amp input, develops a generator peak output of 1200 w at 40 kc, and 4000 w at 20 kc. The higher peak produces an impact that cleans with high thoroughness and speed. Unit develops peak power predominantly at 20 kc, and features an electrostrictive transducer, automatic timer, and automatic power control. Generator and transducer are so designed that tuning is unnecessary.

Size of the 5-gal cleaning tank is 14 in. long, 9 in. wide, 9¾ in. deep. Overall dimensions are 25 in. long, 10¼ in. wide, 12 in. high. Price is $860.

Mettler Electronics Corp, 114 W Holly St, Pasadena, Calif

MORE DATA? Circle 116, inside back cover

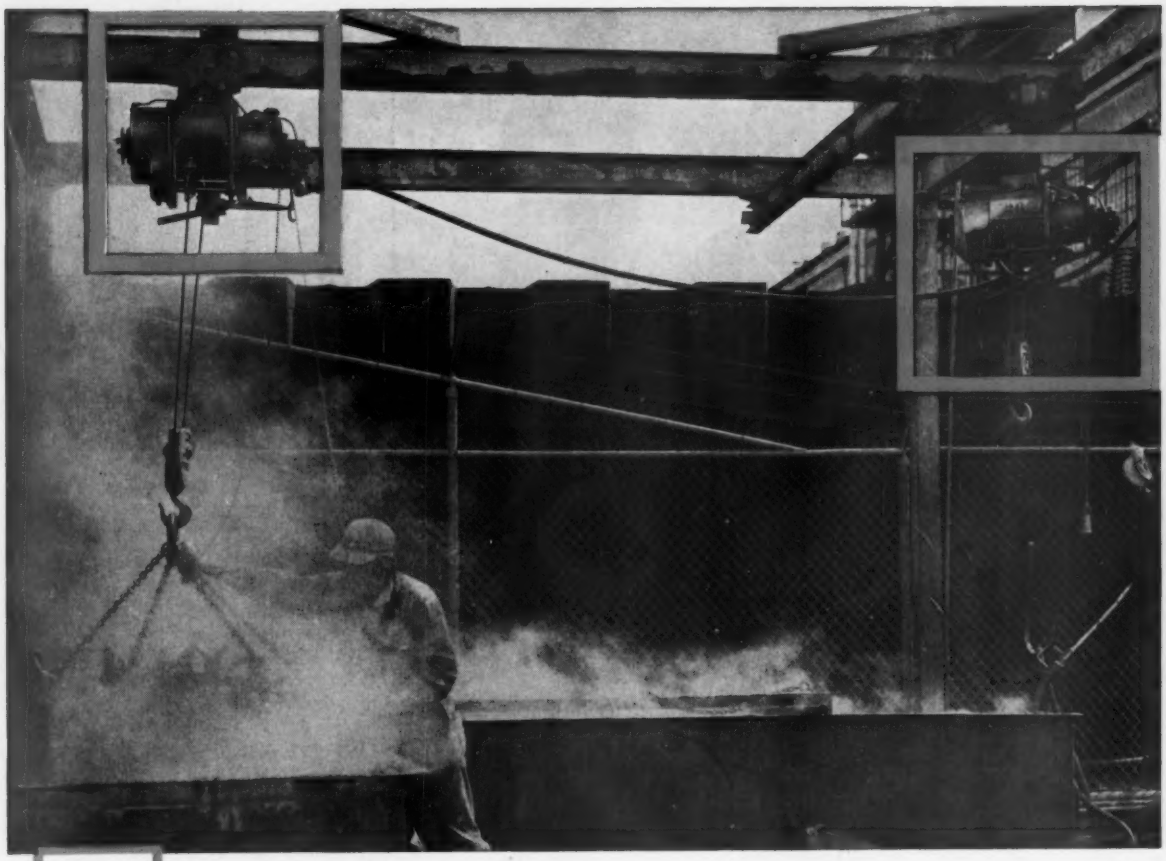


Lovell Adds Compact Flexing Member Couplings to Line

New couplings require no lubrication, are compact, lightweight, and give no backlash. Designed around the flexing characteristics of a nonmetallic material, trademarked Lovellex which is said to have an ideal modulus of elasticity and a flexural fatigue strength exceeding that of steel, the units are available for shaft diameters from ½ to 3½ in.

Lovell Mfg Co, Erie, Pa

MORE DATA? Circle 117, inside back cover



IR AIR HOIST *is safe from corrosion ... can't cause explosion!*

The air motors that power Ingersoll-Rand AIR hoists are unaffected by fumes, vapors or moisture. Dust and dirt cannot get in to cause premature wear or corrosion and interfere with the hoist's operation. And . . . because the motor is operated by air, not electricity, there can be no sparks which could set off a damaging, even lethal, explosion.

Maintenance of Ingersoll-Rand hoists is unbelievably low—electrical contacts, switches and windings cannot cause trouble because these hoists are powered by air!

PROTECTS LIVES, LOADS, PROPERTY...

Loads can't "run away" even if air supply should fail.

PRECISE FINGER-TIP CONTROL, INFINITELY VARIABLE SPEEDS...

Simple, foolproof, air throttle permits "stepless" speed control of loads.

Over 110 different sizes of Ingersoll-Rand AIR hoists (capacities from 200 to 24,000 lbs.) are available to solve your lifting problems. For details, or a demonstration, call your nearby Ingersoll-Rand representative.

Ingersoll-Rand

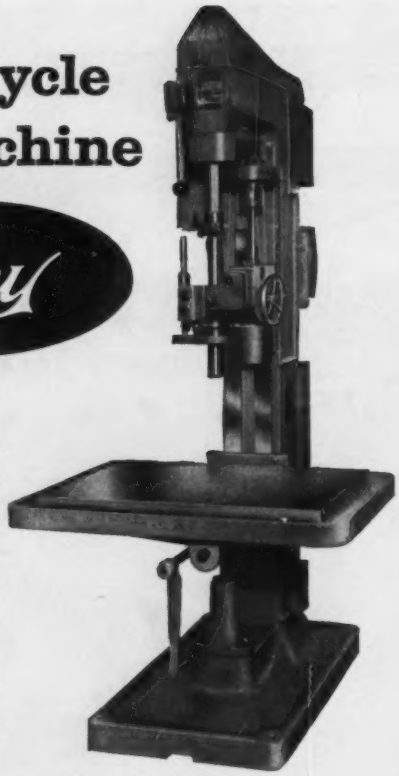
11 Broadway, New York 4, N. Y.

Planned Annual Retooling increases output per man

217A-8

automatic cycle drilling machine

Avey



You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit. Adjustable rapid power traverse, feed, and rapid return of the spindle permit automatic transfer or rotary index fixturing. You also get adjustable feeds, speeds, table travel, head travel, and Avey's precision spindle. Morse Taper 2, 3, or 4; single or multiple spindles 1 to 5 hp. *Write or phone for data.* Avey, Box 1264, Cincinnati 1, Ohio.

CIRCLE 380 READER SERVICE CARD

Protection for Man and Machine

FUTURMILL'S "Way-Life" WAY COVERS

Way-Life covers are lightweight—yet very strong. The extruded aluminum sections are ribbed full length with a full length ball and socket type interlocking hinge.

SAVE THE WAYS—"Way-Life" covers keep chips, grit, dirt and other foreign matter out of the ways and feed mechanisms. The solid aluminum, interlocking sections will absorb a considerable amount of shock and prevent damage to the ways—such as caused by accidental dropping of heavy objects on the ways.

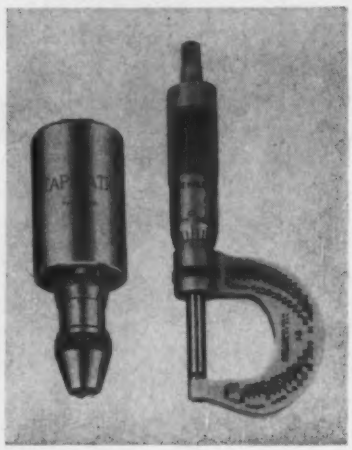
WORK WITH SAFETY—The strength and rigidity of "Way-Life" covers permit operators to walk safely on top of the cover, making machine servicing and job set-up safer and easier. It is impossible for personnel to fall through the cover or become caught or trapped between the ways.

CUT COST & MAINTENANCE—Unlike fabric, rubber, plastic, sheet metal, foil, telescopic, or accordion type covers, "Way-Life" covers will not burn, warp, tear, rust or buckle. They require no auxiliary power since the cover is motivated by table or column movement. No special servicing is necessary.

DRESS UP YOUR SHOP—"Way-Life" covers are *full dress—armored protection* for any machine . . . a complement of utility—economy and cleanliness for any shop.

Write: **FUTURMILL, Inc.** 19720 W. Eight Mile Rd. Southfield, Michigan

NEW SHOP EQUIPMENT



Tapmatic Attachments Increase Drilling Speeds to 22,500 rpm

Tapmatic drill speeders with ratios from 2.50 to 1 to 15.50 to 1 enable operators to get speeds of 22,500 rpm from machines that have a maximum spindle speed of only 1500 rpm.

Compact all-ball bearing design gives small sizes despite the large speed increases. Model 62, with a standard ratio of 7 to 1, weighs only 9 oz and has a major diameter of 1 5/16 in.

Design of the drill speeders also eliminates gears and contributes to quiet vibrationless operation so that small hole drilling is accurate.

The speeders are made with threaded or tapered mounts for universal application on all types of manual, semi-automatic or fully automatic drilling machines.

Tapmatic Corp, Costa Mesa, Calif

MORE DATA? Circle 118, inside back cover

FOR PRECISION SPOTTING AND SCRAPING the 60 degree angle on machine gibs and slides these spotting plates have tolerances for straightness and flatness on all flat surfaces of ±0.000025. The tolerance on all 60 degree angles is + 0 degrees 0 minutes 0 seconds, — 0 degrees, 0 minutes, 30 seconds—*Rahn Granite Surface Plate Co, 644 North Western Ave, Dayton 7, Ohio*

MORE DATA? Circle 119, inside back cover

faster finishing...by far!

The new SWECO Vibro-Energy* Finishing Mill does in 35 to 165 minutes what ordinary vibratory equipment *takes 5 hours to do.* Results of 8 impartial comparison tests (weight loss in grams and RMS improvement, on cast iron, hard steel, stainless and aluminum) prove SWECO produces the same finish *in 45% to 88% less time.* Charts of all 8 tests are included in a new, illustrated technical treatise that will be mailed on your request. It describes in detail the superior performance of high-frequency, three-dimensional vibration in finishing metal, ceramic and plastic parts. For a copy, write SOUTHWESTERN ENGINEERING COMPANY, 4800 Santa Fe, Los Angeles 58, Dept. 75381.

SWECO
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Vibro-Energy Separators, Grinding Mills, Finishing Mills

★*See our exhibit at the Detroit Metal Show, Oct. 23-27*

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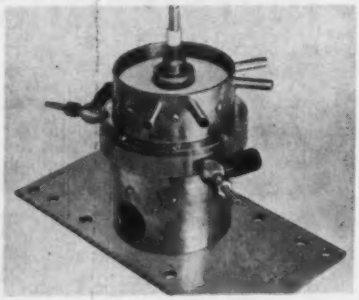
NEW SHOP EQUIPMENT



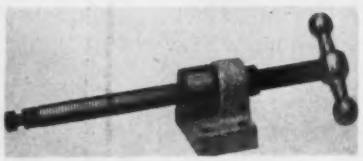
Arc Switch Rated for 7-20 KV Has 2500-Joule Capacity

Model AS-25, designed to facilitate the controlled discharge of stored electrical energy in lab and production applications, is actuated by spark ejection generated by the Model ASE-10 arc switch trigger electronics. In operation, a capacitor is charged to the desired potential. Then, at the convenience of the operator, a secondary high voltage discharge ionizes the switch spark gap, causing it to conduct, discharging the capacitor. Jitter is approximately one microsecond. As this discharge occurs in an inert atmosphere, component life is greatly lengthened.

The unit is designed for use with Cornell-Dublilier NRG-200 Series capacitors; basic design, however, is adaptable to other capacitors. Price is $800.

MHD Research Inc, PO Box 1815, Newport Beach, Calif

MORE DATA? Circle 120, inside back cover



Pressure Unit Designed for Use As a Clamping Component

Quick-acting pressure unit for use as a clamping component in jigs, fixtures, and other tooling, and special clamping operations, has push-pull lock and release. A twist of the handle unlocks; a quick turn clamps the work. The standard unit is suitable for clamping ranges of up to 8 in. The bar is furnished with a plain soft end for machining and adapting to any application. Manufacturer claims that no slippage is possible because of specially designed locking arrangement.

Universal Vise & Tool Co, Parma, Mich

MORE DATA? Circle 121, inside back cover

NEW DI-ACRO POWER SHEAR NO. 48

up to 160 strokes per minute

Micrometer operated ball bearing back gauge graduated in .001".

Electric clutch provides instantaneous action.

Inclined ram keeps only blade edge in contact with material.

Spring loaded feet compensate for variations in width and thicknesses of material.

The all new Di-Acro Power Shear No. 48 is a high speed, high production machine. Material capacity is 16 gauge mild steel across a 50 inch blade length. Standard equipment includes a micrometer operated ball bearing back gauge graduated in .001". This back gauge is double bracketed. An optional front operated control includes a counter with direct readings in both inches and thousandths.

The high-torque, high-slip totally enclosed motor of the Shear drives a flywheel with a built-in self-adjusting electric clutch. Triple V-belt drive is quiet, gearless. Because the electric clutch engages instantly without pausing for pins, splines or valves, the No. 48 shears at up to 160 strokes per minute on single cycling . . . ideal for use in conveyor and run-out lines. An adjustable cam operated brake engages only at the top of the stroke—no drag to wear out linings and absorb power.

Inclined ram keeps only the blade edge in contact with the material to be sheared. The angle of the blade counteracts thrust, keeps the blade straight and reduces force needed to shear material. It also permits the use of easy-to-sharpen straight sided blades which can be rotated to use all four edges for shearing.

The hold-down bar operates automatically and acts both as a safety guard and a material clamp. Individually spring loaded feet compensate for variations in material thickness and for shorter than full width sheets.

Standard equipment includes motor, automatic hold-down, micrometer operated back gauge, front gauge bar and brackets, side squaring gauges, reversible protractor gauge, one set of alloy tool steel four-edged blades, and a movable foot trip pedal.

For complete information consult the yellow pages of your phone book under Machinery: Machine Tools for the name of your nearest distributor or write us.

Find Us Fast in the Yellow Pages

See complete Di-Acro line in Sweet's Machine Tool Catalog

pronounced die-ack-ro

di-acro PRECISION METALWORKING EQUIPMENT

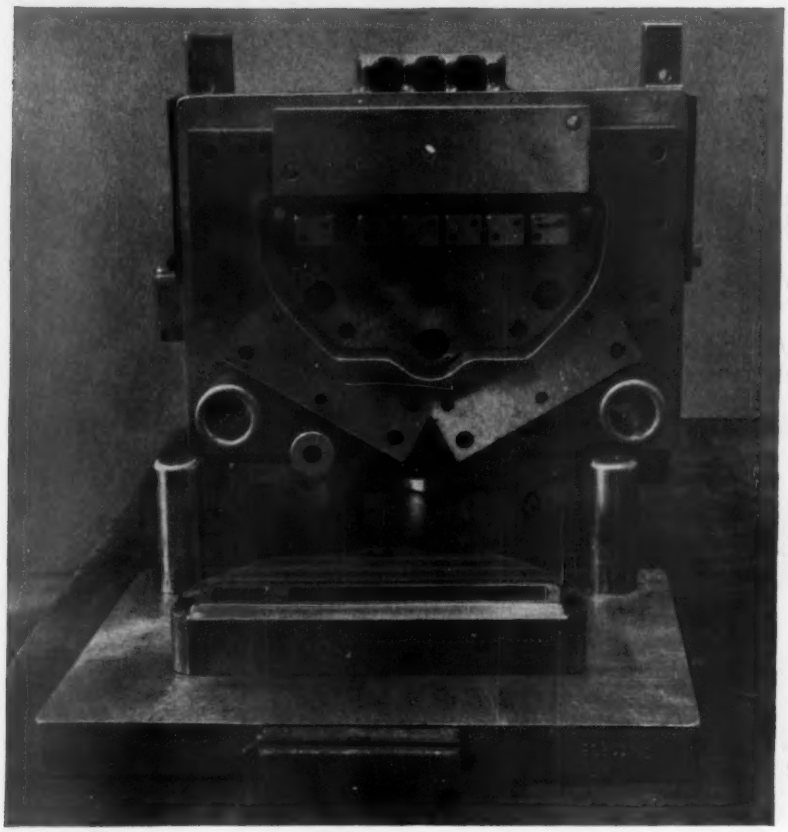
DI-ACRO CORPORATION
(formerly O'Neil-Irwin Mfg. Co.)
219 Eighth Avenue
Lake City, Minnesota

CIRCLE 383 READER SERVICE CARD

CIRCLE 370 READER SERVICE CARD

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.



Bethlehem Brake Die Tool Steel Forms Vacuum-Cleaner Base Plate

At Remmele Engineering, Inc., St. Paul, Minn., they needed a tool steel with high strength to handle a difficult forming operation on sheet steel. The part, a base plate for a vacuum cleaner, was produced by a die made of Bethlehem Brake Die tool steel.

Engineers at Remmele liked Brake Die's well rounded combination of fine mechanical properties. They also found it a time saver because it machined so readily. Best of all, it produced thousands of pieces before slight redressing was required.

This tool steel requires no heat-treatment

Brake Die is ideal for intricate bending and forming dies because it combines high wear-resistance with high strength. It requires no additional heat-treatment because it is furnished in the heat-treated condition, ready for machining into a finished die. Brake Die is quenched and tempered in our shop to develop its superior properties. Then we straighten it mechanically and give it a stress-relief-anneal to remove straightening stresses.

Your Bethlehem tool steel distributor has Brake Die on hand in many sizes and sections, ready for prompt delivery. Give him a call today.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

For Uniform Service from Tools, Control the Surface Chemistry

One of the most difficult problems in the use of tools is non-uniformity of service life. Absolute uniformity in production from all identical tools is not expected. But wide variations in service life from one tool to another, or from one lot to another, present a real problem.

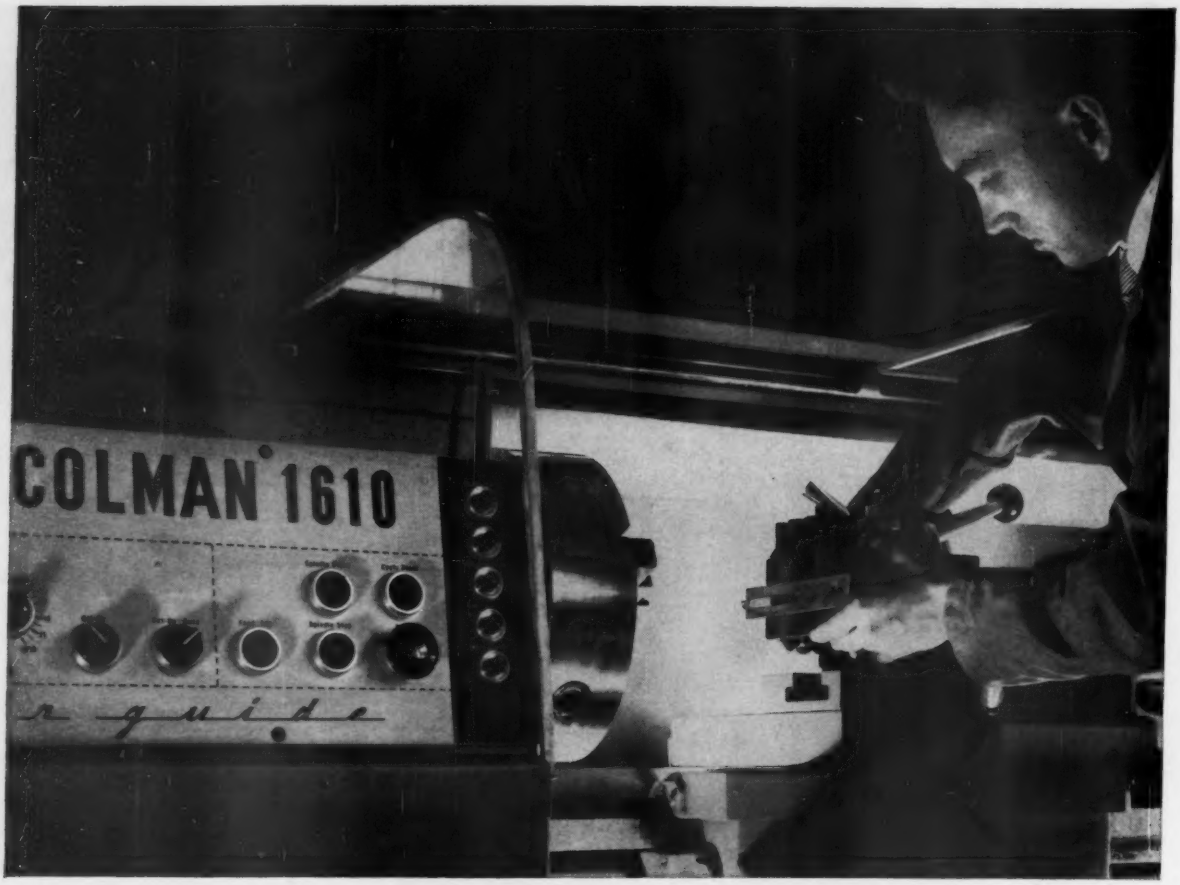
It has been found that the most frequent cause of non-uniform service is the variation of chemistry on the tool surfaces. Small amounts of surface carburization or decarburization usually are unnoticed because they can be detected only by destructive testing.

Decarburization on working surfaces of tools causes a decrease of normal service life. And varying amounts of decarburization from tool to tool will cause variable decreases in service life.

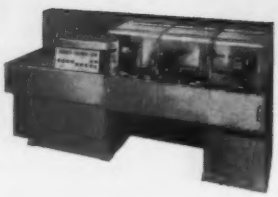
Carburization, on the other hand, is not always harmful. Many tools last longer if a carburized case of the optimum depth and carbon content is present. This is true whether the carburized case is intentional, or whether it is accidentally and unknowingly present. The extent to which a carburized case either increases or decreases service life of tools must be determined by experience with the actual tools under consideration. It is therefore possible for tools with a "neutral" surface to be either better or poorer in service life than tools having a carburized case.

The surest way to provide uniform surface chemistry is to grind the tools adequately after the hardening operations. The only alternative is to be sure that "neutral" heat-treatment equipment is actually doing the expected job of providing unground hardened tools with neutral surfaces.

CIRCLE 384 READER SERVICE CARD



The Tape-r-guide can cut 700 different step-free tapers; can do cutoff and boring as well as internal or external step-turning; can form simple radii or chamfers—all under tape, without special tools.



TAPE

■ Increasing cutting speeds may squeeze a few pennies out of your direct costs . . . but numerical control is the way to chop dollars out of TOTAL COST. That's why the Tape-r-guide lathe, which combines all of the benefits of numerical control with the simplicity and economy of a MECHANICAL machine, is one of the most profitable investments you can make. For instance—lot-size economics and delivery requirements *add* to your finished and in-process inventories. These inventories cost

your company 18% to 25% of their value annually and tie up operating capital. The Tape-r-guide...so practical and versatile

you can set up and machine complex parts *in short runs*... gets to the heart of this problem. More people can devote more time to *production*—less time to part-handling, record-keeping, part-protection, storage, and design of gimcrack tooling. Costly templates and form tools are eliminated. There's no cut-and-try scrap. *Average* machine *operators* can learn to do a variety of jobs easily and quickly. Cutting tools can be preset in quick-change holders. You don't have to use machine tools to do what tooling and gages can do *better* at lower cost. You can estimate your costs accurately. Methods

PAYS BIG

people can control feeds and speeds, tool life, and production schedules. These are the big *hidden costs* now challenged by the Tape-r-guide lathe. Visit our shop and watch a Tape-r-guide in regular daily use...handling small job lots on a production basis ...with no need for a console, a computer or any complex measuring or feedback electronics.

BARBER COLMAN

BARBER-COLMAN COMPANY 91 Loomis Street, Rockford, Illinois

Solve it . . .

with **AIR-LOC** Mounting Pads

For isolating and dampening vibration, Air-Loc is the answer. In actual production tests, it successfully reduces vibration up to 85%. Air-Loc is easy to install in a matter of minutes. It can be quickly shimmed for leveling, gives permanent machine alignment . . . and is re-usable.

The scientific cross-grid embossing of Air-Loc machinery pads literally anchors your machines to the floor . . . without cement, without bolts.

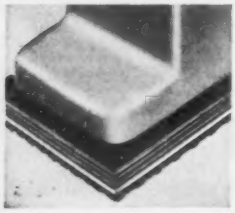
Air-Loc is made of three materials, and each plays its part in giving you the ultimate in easy, yet positive machine mounting:

Cork — absorbs vibrations, shock and noise. The cork used in Air-Loc is specially processed, under patents, to bring out its best physical properties.

Sisal Fibre — selected long-fibred sisal adds strength and stability.

Vinyl — completely surrounds the cork and sisal to give exceptional durability and permanent resistance to oils, alkalies and acids.

Write today for full information and sample.



Air-Loc® DIVISION

Clark, Cutler, McDermott Co.

100 WEST CENTRAL ST. • FRANKLIN, MASS.

NEW SHOP EQUIPMENT

Portable Sandblaster Has 6-in.-dia Tank

Model 28A, made of ⅛-in. steel, is 29 in. high, weighs 25 lb empty, and has an abrasive capacity of 28 lb of sand. Units are tested for 300 psi and operate on the same air hook-up as a production spray gun.

Squeeze grip abrasive delivery nozzle allows operator to control and shut off flow at will. Pressure gage and pressure relief valve are standard equipment. Unit will consume abrasives between 20 and 100 mesh. Price is $140 fob.

Handi-Blast Div, Hamill Mfg Co, Washington, Mich

MORE DATA? Circle 122, inside back cover

Compact Swing Frame Grinder Operates at 9500 SFPM

Compact unit, added to the Marschke line, is powered by a 5-hp 3600-rpm motor to drive resinoid wheels at 9500 sfpm. Spindle will take grinding wheels 7 or 10 in. in diameter by 1-in. face width by 1-in. bore. Operator fatigue is reduced to a minimum because the unit is suspended in perfect balance and has a three-handle arrangement which allows it to be manuvered easily into position.

Grinding & Polishing Machinery Corp, 2530 Winthrop Ave, Indianapolis 5, Ind

MORE DATA? Circle 123, inside back cover

New THREE COORDINATE Optical Measuring Machines Hydroptic 6AM/7AM for precise measurement of large three dimensional mathematical shapes. DIR4 Automatic Repeating Control for table and spindlehead–or CN5 SIP Numerical Control for automatic positioning of table, spindlehead and vertical measuring quill—are also available.

SIP

For information or nearest distributor, write to
AMERICAN SIP CORPORATION
ONE HUNDRED EAST FORTY SECOND STREET, NTW YORK 17, N. Y.

CIRCLE 388 READER SERVICE CARD

IMPORTANT MESSAGE

to the Aircraft and Steel Producing Industries

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Proved fast method of flat grinding

STAINLESS *and* TITANIUM SHEETS

HONEYCOMB

holding ± .001 inch with negligible burr

Aircraft fabricators have proved it. Conveyorized abrasive belt grinding is the **fastest, most economical method** of finishing wide honeycomb cores and stainless or titanium sheets to within ± .001 in.

Two types of rigid, wide-belt wet grinders are increasing production rates and setting a new standard of reliability in continuous, heavy-duty operation. Sandwich construction no longer is limited by sheet or honeycomb finishing operations.

The Mattison No. 458 conveyorized grinder is designed for fast, batch-type grinding of honeycomb cores. See if you don't find these features entirely logical for fast production grinding and high accuracy:

1. Four rolls in the diamond-shaped head continuously "flex" the long (20 ft, 3 in.) abrasive belt—keep it clean, cool, and free-cutting.
2. Separate contact and drive rolls prevent transfer of motor pulsations to the work.
3. Clockwise rotation of abrasive belt, **pulled through** the grind point under constant tension, assures positive grain penetration and high stock removal rates.
4. Table upfeed through six precision jacks maintains perfect parallelism in all directions.
5. Automatic table upfeed (increments from .0002 in. to .005 in.) is pushbutton actuated. Pushbuttons or handwheel to control rapid vertical traverse.

The No. 456 pinch-roll-feed wet grinder, with the same rigid head design and advantages, is used to:

1. **Finish PH15-7Mo stainless to 32 microinches, or better.**
2. **Economically grind copper sheets used in sandwich brazing to uniform thickness.**

Stabilized air control on the billy roll makes grinding pressure constant throughout the length of the sheet and avoids taper grinding. Positive billy roll stops are manually controlled in increments of .001″ or finer.

Electronic billy roll actuation holds uniform grinding pressures within ¼ in. of lead and trailing ends—prevents sheet marking caused when sharp ends scrape an abrasive belt.

For a convincing demonstration in the Mattison Methods Lab, phone your Mattison dealer or write us.

MATTISON MACHINE WORKS
Rockford, Illinois Phone WOodland 2-5521

No. 458—conveyorized

No. 456—pinch-roll-feed

Field Report

Scherr-Tumico to Build in Israel

Contract with the Government of Israel has been signed by Scherr-Tumico Inc to build a plant which will manufacture a complete line of mechanical, optical, and electronic measuring devices within five years. The Minnesota-based firm, producer of precision measuring tools and instruments, intends the Israel facility to be its first step in the establishment of a worldwide manufacturing and sales organization.

The market for measuring devices in Israel is expected to produce about $300,000 in sales the first year. And, Israel has bi-lateral trade agreements with more than 30 free-world countries; Sherr-Tumico will be able to increase its sales substantially to most of these by shipping from Israel. Increased export business via that country is expected to produce some $300,000 in sales the first year of operation, $700,000 the second year, and over $1 million the third year.

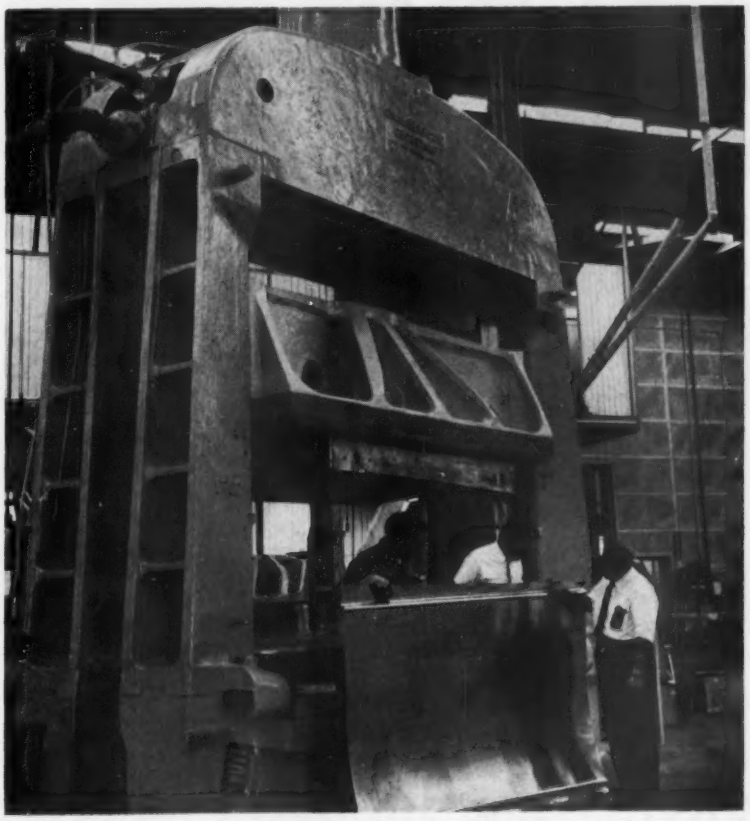
Martin-Marietta Corp Formed

Directors of the Martin Co in Washington, DC, and American Marietta Co in Chicago have formally approved plans for consolidation of the firms into a new industrial enterprise to be known as Martin-Marietta Corp. Stockholders of both firms will act upon the proposed plan at meetings to be held Oct 9.

Martin will continue its present missile, aerospace, electronic, and nucleonic activities and views the consolidation as an opportunity for diversification into commercial fields. American-Marietta is a leading producer in a number of basic growth industries including paints and industrial finishes, synthetic resins and adhesives, chemicals and a wide variety of building and construction materials. Company's sales have grown from $66 million to $368 million in the past decade and profits have increased from $2.8 million to $24 million.

McKay to Make Wean Lines

McKay Machine Co, Youngstown, Ohio, has been licensed to manufacture lines of metal processing equipment formerly produced by Wean Equipment Corp of Cleveland. McKay has been sales representative for Wean since February 1960 and will now turn out Wean machinery in addition to its own products and those of its subsidiaries.



104-ton Ceco drop hammer at Boeing Co's Plant No. 2 in Seattle will take a maximum size square area die of 72 x 110 in. The $142,000 unit, made on special order by Chambersburg Engineering Co, Chambersburg, Pa, is the largest that the company makes. First part stamped out on the hammer was an inside skin doubler reinforcing the center section of the 707 airliner body

Mare Island Ups Hiring

The Naval Shipyard expects to add 500 workers to its force following receipt of two more Polaris sub contracts. Number of employees will be increased from about 10,000 to some 10,500 during the third quarter of this year.

Texaco Automates Lubricant Plant

Nation's first lubricating-oil blending plant run by fully automated electronic controls has been opened by Texaco Inc in River Rouge, Mich. The multi-million-dollar facility will blend and compound more than 40 types of consumer and industrial oils for the midwest market.

Central feature of the plant operation is an electronic control console which enables a technician to mix automatically as many as six additives and base stocks at a time. After blending and componding, finished lubricants are pumped directly from the automatic blender to a barrel-filling line, stored in compartmented tanks indoors, or routed to loading racks for tank trucks and cars.

$11 Million Orders to Avco

New contracts totaling $11.2 million for ordnance and arming and fuzing of missiles have been received by Avco Corp's Electronics and Ordnance Division. Work will be carried out at the Richmond, Ind, plant.

Puerto Rico Calling

Puerto Rico attracted 17 new US metalworking plants during fiscal 1960-61 as part of the Commonwealth's Operation Bootstrap. Companies include Dodge Inc, Kelvinator International, Products Engineering

More Pieces COMPLETELY *finished in less time on* GOSS & DE LEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & DeLeeuw feature provides for finishing machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.

Send for illustrated literature which fully describes this recent Goss & DeLeeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS & DELEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

FIELD REPORT

Corp, Mayflower Packaging Co, and Aluminum Anodizing Corp of America. The island's US-affiliated metalworking industry shipped $15 million worth of goods to the US last year.

Cope Touring Far East

Stanley R Cope, founder and president of the Acme School of Die Design Engineering, headquartered in South Bend, Ind, is visiting the Philippines and Japan to further expand the Cope training system. He plans to set up an Acme school in Manila and will visit factories for technical consultation on designing of tools, dies, jigs, and fixtures. Mr Cope will visit Osaka and Tokyo where he is scheduled to lecture before the Japanese Society of Technology and Plasticity, and the Japanese Society of Mechanical Engineers, as well as at the University of Osaka Prefecture, and other institutions. While in Tokyo, Mr Cope plans to discuss feasibility of translation of the Acme course into Japanese and to offer the courses to Japanese technical schools.

The first Acme school was founded in South Bend in 1935 and, since then, the system has expanded to 25 schools in the US, plus others in Canada and France.

Harker Manufacturing Co . . .

. . . is a new heavy metal products manufacturer that'll build a $2.5 million plant at Woodruff, SC. Employment will be between 150 and 200 persons.

MPB Buys Wafe

Wafe Manufacturing Co, Bridgeport, Conn, designer and manufacturer of precision tools and dies, has been acquired by Miniature Precision Bearings of Keene, NH(world's largest manufacturer of precision miniature and split ball bearings. The Wafe Division of MPB will move to larger quarters in Bridgeport.

AM/MM

"You say the part is this long, threaded at one end, and you need it in a hurry?"

FROM NEARLY A CENTURY OF QUALITY

NICHOLSON HOLE SAWS

A complete range of tools and accessories for every hole-cutting job 9/16" through 6" in Shatterproof High Speed Steel and Magicut Carbon.

Produced by the same traditional devotion to quality that marks other Nicholson products, these hole saws are a planned addition to Nicholson hacksaws and band saws. Try them: Your Nicholson Saw Distributor* should have a well-balanced inventory on hand.

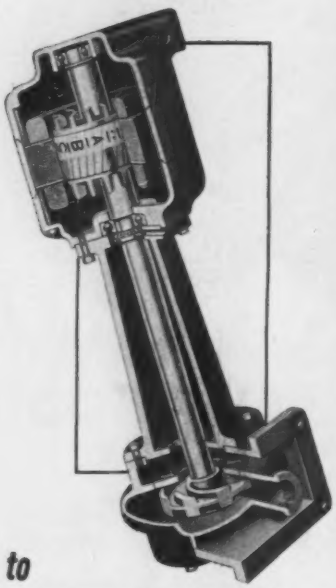
* Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.

NICHOLSON FILE COMPANY, Providence 1, Rhode Island • Files • Rotary Burs • Hacksaw and Band Saw Blades
Hole Saws • Ground Flat Stock • Industrial Hammers

NICHOLSON U.S.A. **NICHOLSON**

Gusher

Coolant Pumps are PRECISION BUILT



to

- LAST LONGER
- PERFORM BETTER

ON YOUR MACHINES

You get better performance from your GUSHER Coolant Pumps because they are precision built. The one piece shaft in GUSHER Pumps is electronically balanced to cut vibration to a minimum. Ball bearings are pre-lubricated, no seal or packing needed. Write for catalog.

THE Ruthman MACHINERY CO.

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

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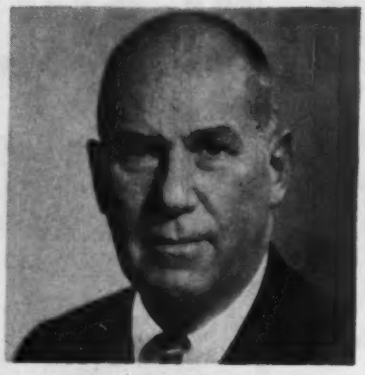
194 CIRCLE 393 READER SERVICE CARD

NAMES IN THE NEWS



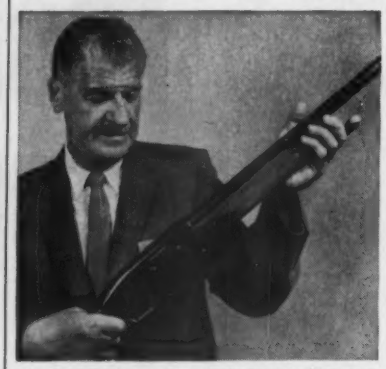
Machinery Associates Inc, metalworking equipment distributor headquartered in Wynnewood, Pa, has elected **C Denson Day** president to succeed **Raymond A Vidinghoff** who will continue as treasurer and board chairman. Mr Day, formerly vice president, is also second vice president of the American Machine Tool Distributors' Association

Chicago Pneumatic Tool Co, New York, has named **Russell B Miller** general sales manager. He has been manager of the Atlanta District since 1952

Amertool Services Inc has elected **Howard A Finch,** manager of marketing for **Jones & Lamson Machine Co,** president. **J A Gerard,** vice president, **Cone Automatic Machine Co,** has been elected vice president. Mr Finch succeeds **Nelson F Caldwell,** vice president, **Cincinnati Milling Machine Co,** who has been president of Amertool since its organization and now becomes chairman of the board. Amertool was established in 1949 by twelve of America's leading machine tool builders to provide technical selling and servicing assistance (as well as long-term financing) to the foreign distributors of the member companies.

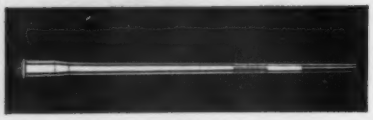
Micro Metals Corp, Passaic, NJ, metal powder producer, has named **Michael K Tudor** executive vice president.

Tomorrow's tubing technology—today



The Superior tubing used in the barrel of the Winchester Model 59 is .772 in./.777 in. OD x .727 in./.732 in. ID. The material is Seamless Type 1035 carbon steel overwound with glass fibers.

Superior tubing helps make a stronger shotgun barrel



When starting development work on its Win-Lite steel and glass fiber wound shotgun barrel, Winchester-Western Division, Olin Mathieson Chemical Corporation, New Haven, Conn., turned to Superior for help in getting the steel tubing required. After consultation with the company's engineers, we recommended Seamless Type 1035 carbon steel tubing with special heat treatment to provide the yield strength and ductility needed to permit upsetting of the stock end of the barrel. We also helped establish a sampling program to provide the desired surfaces, particularly ID smoothness. The result was a barrel that combines the strength of steel with the strength and lightness of glass fibers skillfully wound, fused and bonded to the thin steel liner — a stronger barrel than ever before.

If you have a problem involving small-diameter tubing, call on us. We offer more than 120 analyses, in sizes from .010 to ⅝ in., and in quantities from 50 to over 1,000,000 ft. Bulletin 42 gives details. Write for a copy today. Superior Tube Company, 2505 Germantown Ave., Norristown, Pa.

Superior Tube ST

The big name in small tubing

NORRISTOWN, PA.

West Coast: Pacific Tube Company Los Angeles, California

CIRCLE 394 READER SERIVE CARD

Precision Ground

Atrax

SOLID CARBIDE TOOLS AND BURS

Job Applications

ATRAX LEADS IN ELECTRONICS & SPACE AGE SOLID CARBIDE TOOLING

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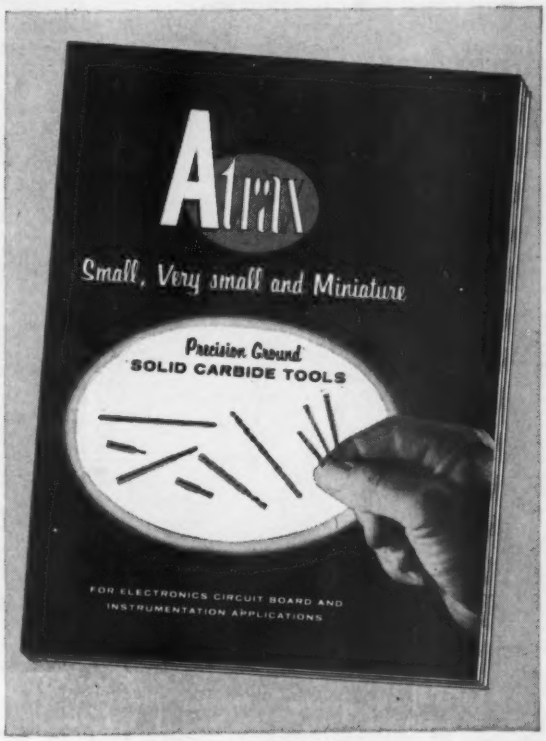
Small, Very small and Miniature

TOOLS FOR ELECTRONICS CIRCUIT BOARD AND INSTRUMENTATION APPLICATIONS



This brochure is available free. It's a guide for selecting and ordering carbide tools for practically any operation on conventional materials as well as abrasive plastics, fibers, synthetics, laminates and exotic materials and alloys.

ATRAX MICRO-DRILLS

Wire Sizes #40 through #80.

ATRAX DRILL BLANKS

Wire Sizes #40 through #80.

ATRAX MINIATURE END MILLS

From 1/32" to 1/8" diameter in 2 flute and 4 flute series.

ATRAX MINIATURE STUB ROUTERS

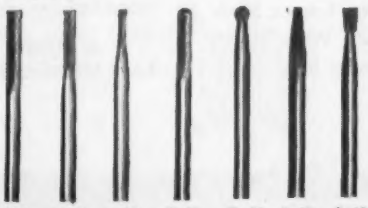
Recommended for routing glass epoxy materials, Fiberglas, phenolics, bakelite, fiber and other synthetic materials.

ATRAX MINIATURE HOLE GRINDING BURS

Hole finishes of 2 micro-inches or better can be expected using these burs.

ATRAX MIDGET BURS

All burs with 3/32" shanks, 1¼" overall.



ATRAX MINIATURE MICRO-REAMERS

In Fractional and Decimal Sizes. Recommended for all materials up to Rockwell C-56.

SEND FOR THIS NEW BROCHURE NOW!

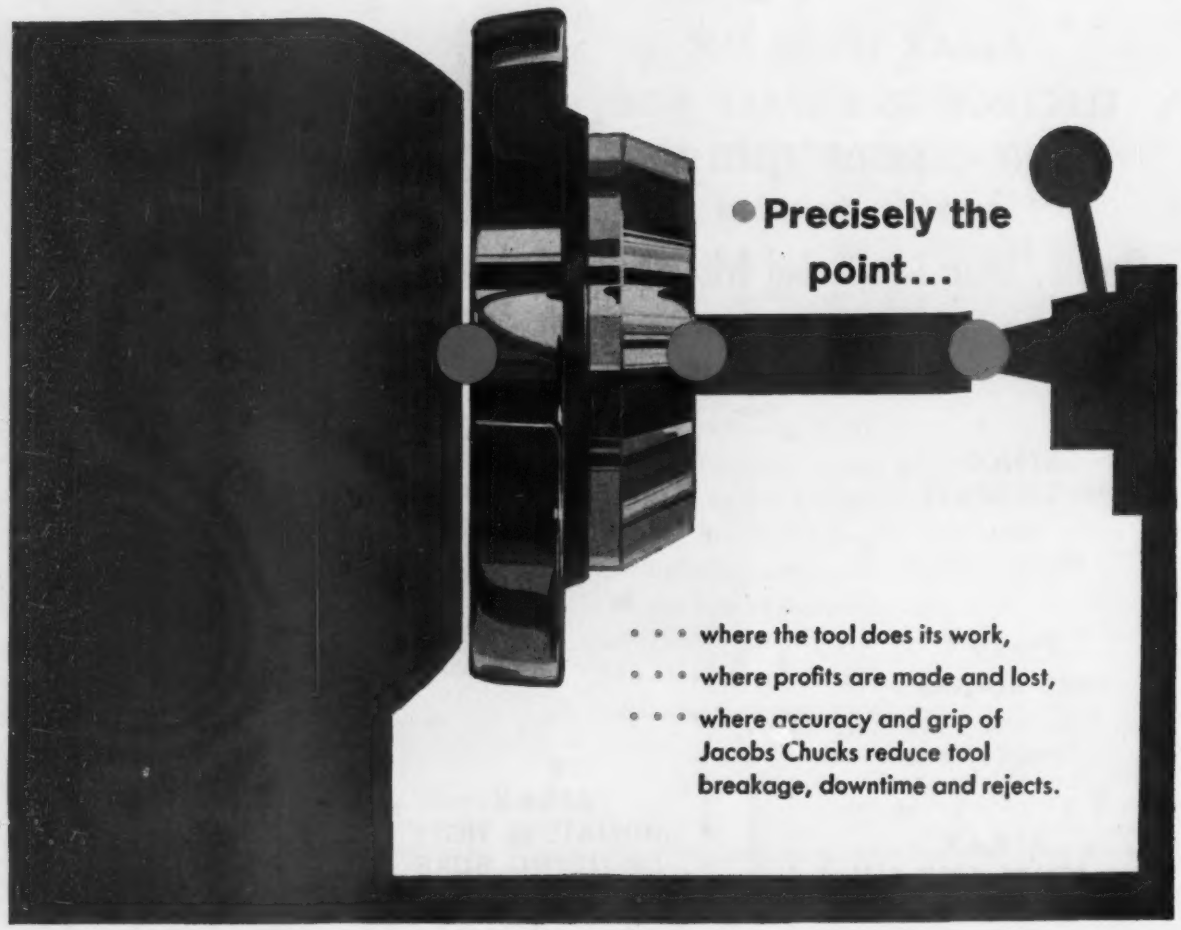
It will help you to longer tool life, improved tolerances and greater production on hard-to-cut materials.

INDUSTRIAL DISTRIBUTION — THE RIGHT HAND OF PRODUCTION

THE ATRAX COMPANY
240 DAY STREET
NEWINGTON 11, CONN.

When you buy new tools or four factors come first

ACCURACY GRIP


Precisely the point...
• • • where the tool does its work,
• • • where profits are made and lost,
• • • where accuracy and grip of Jacobs Chucks reduce tool breakage, downtime and rejects.

The Jacobs Model 50 is the world's most modern collet chuck. Model 50 and its entirely new series of Jacobs Rubber-Flex collets have been developed especially for Atlas, Clausing, Delta, Logan, Sheldon, South Bend and similar lathes. With Model 50 on your lathe you get a lot more for less.

ACCURACY is greater with Model 50 because collet jaws are always parallel and maximum run-out is .001″ T. I. R. at the nose, when properly mounted.

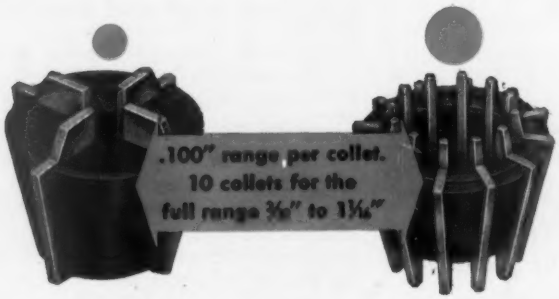
GRIP is greater because the extra long collet jaws have tremendous torque capacity.

modernize your old ones at the chucking end

RANGE PRICE

COMPLETE SET OF 10 RUBBER-FLEX® COLLETS CHUCK ANY BAR BETWEEN 3/32" and 1 1/16"

RANGE is greater because the 10 Rubber-Flex collets in this new series cover a greater bar stock range than **63 old-fashioned split steel collets** . . . .100" range per collet.



PRICE **is revolutionary!**

$70.00 Model 50 Collet Chuck

$65.00 Complete set of 10 Rubber-Flex® Collets

This performance at these prices proves the point. You can't afford not to modernize your lathes with Jacobs Model 50 and Rubber-Flex collets.

See your Jacobs industrial supply distributor. Give him the opportunity to prove the facts with a demonstration at your desk! Call him today. If you'd like further details before you call, write Jacobs, Department 196 at the address below.

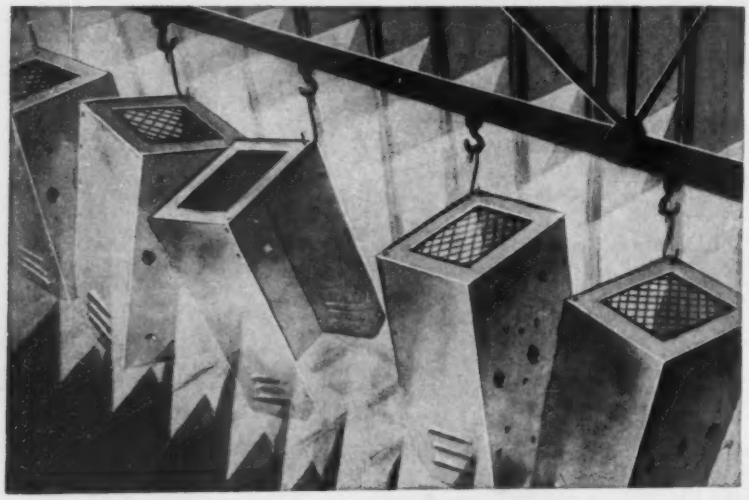
Jacobs CHUCKS

THE JACOBS MANUFACTURING COMPANY,
WEST HARTFORD, CONNECTICUT

For tough steel cleaning jobs

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS



New acid cleaner Oakite 86 gives fast smut removal . . . good paint grip

Shop smuts on steel parts disappear fast with Oakite 86 in the washing machine. A superior acid detergent, it removes all kinds of soils efficiently—really goes to work on heavily smutted steel. In addition, it forms a conversion coating on steel surfaces to give a good grip on subsequent paint coats . . . helps inhibit corrosion.

Oakite 86 also works well when aluminum, zinc, brass and terneplate pass through the washer.

And it is just the latest in a complete line of Oakite materials for spray washing machines. Others include products for high-pressure spraying, for rapid cleaning, for heavy-duty cleaning, for low-heat cleaning, for conversion coatings. Ask the Oakite man which one will work best with your machines, your metals, your specific jobs. Or, write for FREE bulletin. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 Est. 1909 SCIENCE

years' leadership in industrial cleaning

NAMES IN THE NEWS

Roto-Finish Co, Kalamazoo, Mich, producer of finishing compounds and metal cleaners, has promoted **John R Strom** from technical director to vice president

Sel-Rex Corp has promoted **Jerome L Ross** from assistant manager to general manager of the **Meaker Co**, Nutley, NJ, subsidiary which manufactures automatic metal finishing equipment

North American Aviation has appointed **W F Snelling** executive vice president and **Gary Stroh** manufacturing vice president of the Los Angeles Division. Mr Stroh, formerly general superintendent, takes over Mr Snelling's former post.

Electric Autolite Co, Toledo, has named **Paul F Allmendinger** director of engineering for the electrical products group. He was previously associated with Stewart-Warner Corp as director of engineering for the Alemite and instrument divisions. **Joseph A DiMizio** has been appointed plant manager of Autolite's Los Angeles wire facility. He was formerly production superintendent at the wire and cable plant in Hazelton, Pa.

Pratt & Whitney Co, West Hartford, Conn, has appointed **Randolph Renda** a member of the consulting staff of the research department. Dr Renda

is a specialist in plasma physics, gas ionization, heat transfer, and thermodynamics. **Bayard Nicholas** has joined the company as market research manager. Mr Nicholas was formerly manager of marketing research and sales development for *American Machinist/Metalworking Manufacturing.*

Lake Erie Machinery Corp, Tonawanda, NY, has named **John M Wolf** vice president and general manager. He succeeds **Elmer A Rich III** who has joined **American La France** as president and chief executive officer.

Borg-Warner Corp has appointed **Stanley B Kurzina Jr** works manager of the **Borg & Beck Division,** Chicago manufacturer of clutches and torque converters. Mr Kurzina was formerly associated with Curtiss-Wright Corp as vice president, manufacturing.

Hanson-Whitney Co, Hartford, Conn, supervisor of field engineering. As- has appointed **Folke H Gustafson** sociated with the company for 38 years, Mr Gustafson is an authority on the manufacture and application of threading tools and gages.

Harris Calorific Co, Cleveland maker of gas welding and cutting apparatus, has named **Frank Hach Jr** chief industrial engineer. He was previously a methods engineer at Lincoln Electric Co.

C A Norgren Co, Englewood, Colo, manufacturer of pneumatic products, has named **James Kyffin** vice president, manufacturing, and **Robert F Dee** sales manager.

Futurmill Inc, Pontiac, Mich has named **Thomas Meggas** sales manager in charge of its milling cutter and accessory product line. Mr Meggas was formerly Detroit manager of Motch & Merryweather Co's Allied Products Division, distributor of Futurmill products.

OBITUARIES

Carl A Bergstrom, 79, founder and board chairman of **Weldon Tool Co,** Cleveland, died July 31.

Eugene P Hagan, 53, vice president and controller of **Worthington Corp,** Harrison, NJ, died July 25.

A J Fisher Jr, 47, executive vice president of **Metal & Thermit Corp,** New York, died Aug 11. •

Compare Index Units! FERGUSON "PROVES OUT" . . . Point by Point.

Selection of components for a production machine should be based upon the machine's return per dollar investment. Matching "first costs" only does not generally result in the design of profitably operated equipment.

Here is a check list for comparison of indexing mechanisms. "Price" is shown in its order of consideration.

1. BACKLASH—None? Some during the dwell or index or both? *Any* backlash during *any* part of the cycle results in wear-causing vibrations and shock loads . . . *The Ferguson Drive maintains zero backlash at all times.*

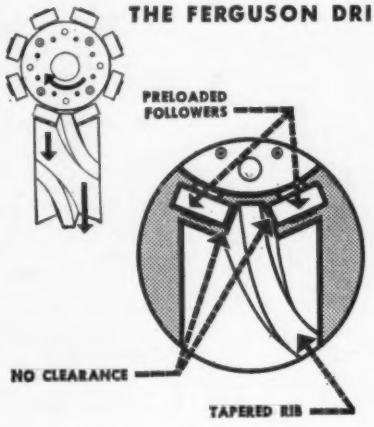
2. RATED LOADS—What is the rated life and under what load? What is the average follower life (B-10 life)? The Ferguson Drive is rated at maximum precision for at least 8,000 hours operation and with an average follower life of 90%. Replacement of the followers renews the life of the Drive for another 8,000 hours. Ferguson cams never wear out under rated loads.

3. JOB SUITABILITY—Can the acceleration characteristic be preselected according to job requirements or is it inherent in the mechanism or limited by the manufacturer? Acceleration of the Ferguson Drive can be chosen after an application evaluation to provide optimum operation.

4. INDEXING ACCURACY—Are time-consuming shot pins necessary for precision? . . . They soon wear and lose accuracy. The Ferguson Drive is positive locking and locating for extreme precision without shot pins.

5. FIRST COST vs. TOTAL COST—Now consider the higher production rates, better quality and much lower maintenance costs the Ferguson Drive gives you. Determine the *total cost* of the various indexing mechanisms. The Ferguson Drive has proved out . . . And you're on the way to building more profitable production equipment.

THE FERGUSON DRIVE



Cam features a tapered rib along which two standard cylindrical followers roll without clearance . . . *maintaining zero backlash during index and dwell.* While in the dwell or "work" position a straight portion of the cam rib locks the hub positively, without auxiliary locating or locking devices. *Extreme precision is inherent,* even at speeds as high as 2,000 indexes a minute!

CATALOG NO. 161 gives complete design data on nearly 100 standard indexing mechanisms, over 150 index tables and various auxiliary items. Send for your free copy . . . There's one for every design engineer.

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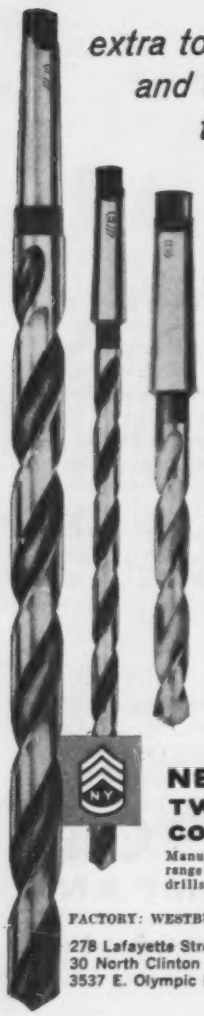
TAKE IT FROM THE DRILL SARGE

NEW YORK TWIST DRILL *manufactures*

TAPER SHANK DRILLS

extra tough and true too!



All regular series to 3½" O.D. available for immediate delivery —Specials made up to 1⅛" O.D.

New York Taper Shank Drills save you 25% on your twist drill bill — as do all the drills in our extensive line. If you wish further information, one of our sales engineers will be glad to call on you.

NEW YORK TWIST DRILL COMPANY, INC.

Manufacturers of a complete range of standard and special drills in all popular sizes, lengths and types

FACTORY: WESTBURY, L. I., NEW YORK

278 Lafayette Street, New York 12, N.Y.
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3537 E. Olympic Blvd., Los Angeles 23

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 TSCHUDIN UNIVERSAL GRINDERS—*Alina Corp, 122 E Second St, Mineola, LI, NY.* 20-page catalog illustrates and describes features of these cylindrical grinders available in three models. These features include roundness to millionths and lap finishes, obtained from vibration-free Tschudin spindle and special sleeve bearings; repeatability within millionths provided by extremely accurate horizontal movement of wheelhead slide; infinitely adjustable plunge feeds; infinitely adjustable selective pick feeds; infinitely adjustable table traverse speeds, up to 200 ipm; infinitely adjustable headstock spindle speeds, 65 to 500 rpm.

2 PLAIN MILLING MACHINE — *Brown & Sharpe Mfg Co, Machine Tool Division, 235 Promenade St, Providence 1, RI.* 20-page bulletin MM 56 contains detailed specifications of Dynamaster No. 2 machines available with 3, 5, 7½, or dual 10/5 hp spindle drive motors and with many optional arrangements. Illustrations cover construction, operations, and optional equipment.

3 SINGLE END BORING MACHINE —*Olofsson Corp, 2727 Lyons Ave, Lansing, Mich.* 2-page bulletin B-1 presents data on new Model 21 designed for finish boring, facing, chamfering, grooving, gun-drilling, bore-reaming, and similar metal removing operations. It can also be used for semi-finishing. The unit can perform repetitive single operations, or a sequence.

4 HYDRAULIC SURFACE GRINDERS—*Thompson Grinder Co, Springfield, Ohio.* 6-page bulletin B561 illustrates and describes features of three machines. Small B type has 6, 8, 10, and 12-in. widths, 18 to 30-in. table work surface lengths; Large B Type has 10 and 12-in. widths, 36 to 120-in. table work surface lengths; Type BB has 12, 14, and 16-in. widths, 24 to 72-in. work surface lengths.

5 LATHE CENTERS AND TAILSTOCK SPINDLES—*Nielsen Inc, Lawton, Mich.* 8-page catalog covers complete line of ball bearing lathe centers and tailstock spindles. Provides details on sizes,

AM/MM

AVAILABILITY

GLOBE Stock Gears are available for "off-the-shelf" delivery from our factory stock or local Distributors.

WHATEVER YOUR REQUIREMENTS:

There's a dependable GLOBE Stock Gear to fit your need.

Write for the name and address of the Distributor nearest you. Profit by his reliable, prompt service of GLOBE Stock Gears.

GLOBE
STOCK GEAR DIVISION
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CIRCLE 401 READER SERVICE CARD

Lou Krakowski, General Superintendent of the Harrison Sheet Steel Company, is a guy who makes no bones about what he wants. It's service! And, for twenty years, he has been getting what he considers the best . . . Cities Service.

Turning out, among many other things, 125 steel desks a day, he wants complete and dependable lubrication service. One of the many Cities Service products he uses to get this job done is Trojan H-2 grease. For general greasing on all equipment, multi-purpose Trojan H grease has a wide range of application. And, because of the variety of jobs Trojan H grease does, it reduces his necessary lubrication stocks.

If you have to *get it on the line* . . . call your nearest Cities Service office . . . or write Cities Service Oil Company, 60 Wall Street, New York 5, N. Y.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

HAMILTON PORTELVATOR®

THE HANDY HAMILTON PORTABLE ELEVATING TABLE

2968

use it with confidence!

If you think that the various makes of elevating tables are "all-pretty-much-alike", that a device so simple allows scant room for *important* points of superiority, then, without fail, you must have a copy of our new, FREE Portelvator Bulletin No. P/2968. Ask for it by name. Ask for it today!

THE HAMILTON TOOL COMPANY

830 SOUTH NINTH STREET HAMILTON, OHIO

REPRESENTED IN CANADA BY

Sykes Tool Corporation, Ltd., Georgetown, Ontario.

CIRCLE 403 READER SERVICE CARD

PIONEER AMERICAN STANDARD.

Over 40,000 in use. Accurate, non-marring hardness testing on small or massive objects such as rolls, lathe beds etc. Model C-2 (above) or Model D with equivalent Brinell or Rockwell C numbers. Repair and calibration facilities at your disposal.

INSTRUMENT & MFG. CO., INC.

90-25 VAN WYCK EXPRESSWAY JAMAICA 35, N.Y., U.S.A.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

capacities, weight of workpieces, tapers available, ordering information.

6 ELECTRIC MOTOR MANUFACTURING EQUIPMENT — *Automation Machines & Equipment Co, 3125 West Mill Rd, Milwaukee 9, Wis.* 4-page bulletin 360 illustrates and gives brief descriptions of a 3-arm and 2-arm loader for notching presses; a multiple torch stator pack welder; a lamination spinner and a lamination orienter; single torch stator pack welder; and an automatic motor shell wrapper.

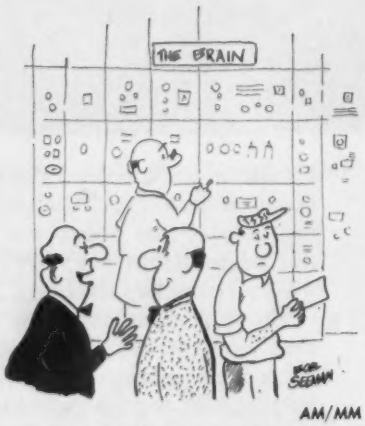
TOOLS AND ACCESSORIES

7 CUTTING FLUID—*Cincinnati Milling Machine Co, Products Division, Cincinnati 9 Ohio.* 8-page brochure, "New Five-Star Cimcool" (PC-375), describes a new chemical emulsion, water base cutting fluid reported to have extremely effective rancidity and rust control. Product produces no odors and, due to new bactericides, it will last four to six times as long as other fluids. Two different kinds of rust inhibitor provide double protection. Table gives recommended starting dilutions for steel, cast iron, brass and bronze, aluminum, cemented carbide.

8 DAVIS BORING HEADS—*Giddings & Lewis Machine Tool Co, Davis Division, Fond du Lac, Wis.* 24-page catalog D-530-A provides detailed information on heads for boring and related operations from ⅝ to 50-in. diameters standard. Heads described are designed for two basic classes of application: those with integral shanks engineered to mount directly in the spindle or toolholder of most machine tools; and heads designed for mounting on Davis boring bars.

9 INDUSTRIAL LUBRICANTS—*Pure Oil Co, 200 East Golf Rd, Palatine, Ill.* 16-page brochure covers complete line and presents a program to streamline industrial lubrication programs. Gives characteristics and uses for company's more than 60 different kinds of products including Puroturbine oils, engine oils, cylinder and heavy mineral oils, gear lubricants, miscellaneous oils, and industrial greases.

10 CHUCKS—*Buck Tool Co, 2015 Schippers Lane, Kalamazoo, Mich.* 24-page catalog 61 (first major revision since 1957) provides information on conventional in-



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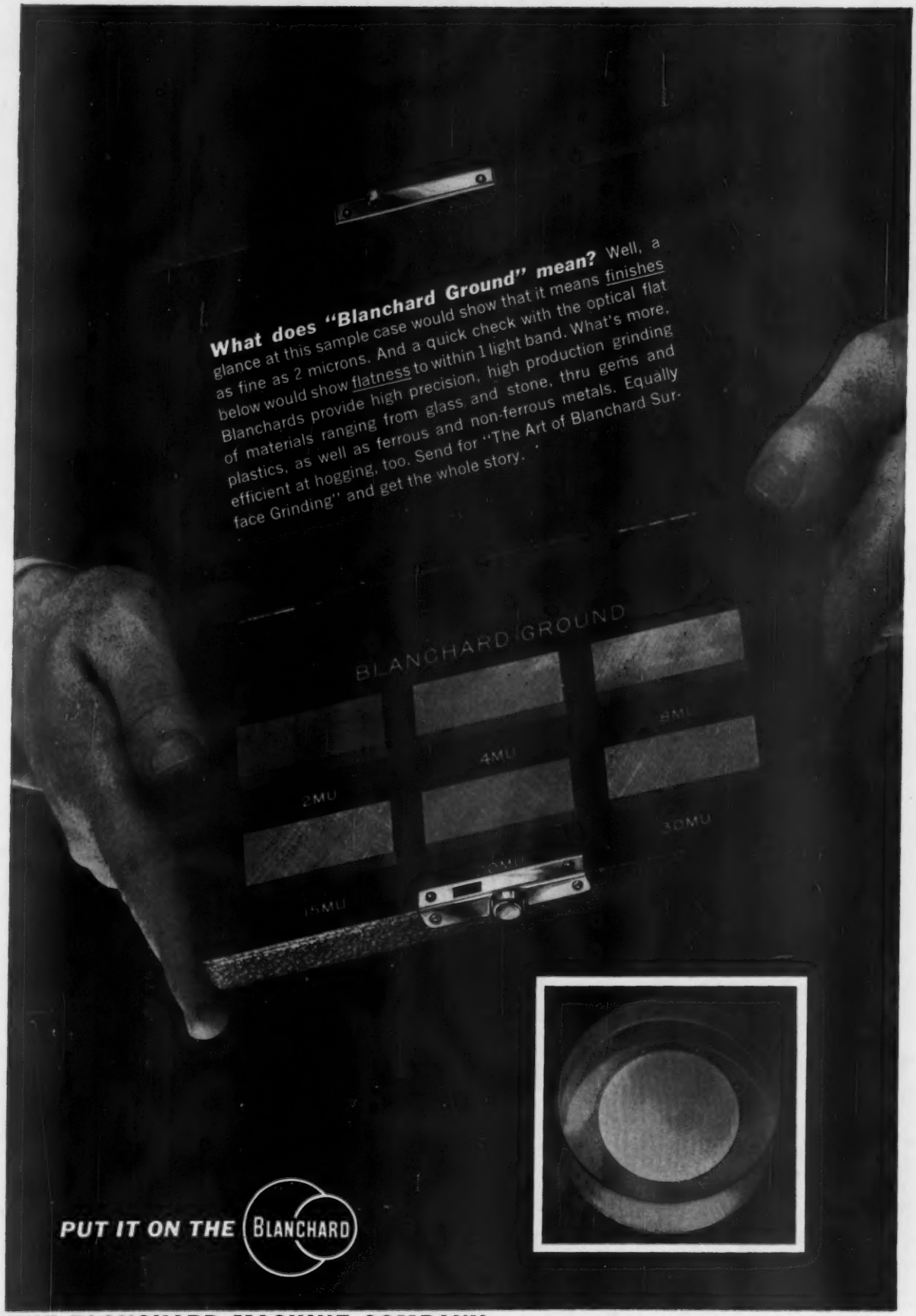
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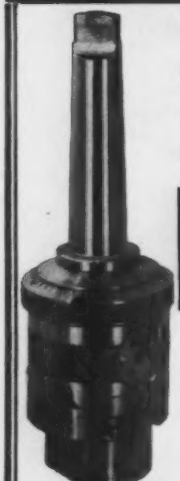

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dependent chucks; the Ajust-Tru 2, 3, and 6-jaw scroll chucks; Ajust-Tru dust-proof and steel power chucks. New items include gibbed keyway aluminum body power chucks to 18 in.; jaw turning fixtures; jaw turning cams; and air cylinders.

11 DIAMOND DRESSING TOOLS—*Koebel Diamond Tool Co, 9456 Grinnell, Detroit 13, Mich.* 12-page catalog 861 illustrates and describes CDP (cemented diamond particles) tools. Designed with uniformly distributed, graded diamond particles securely held in position by means of a newly developed Koebelite powdered metal matrix. Three standard types are available, round, rectangular, and blade; other adaptations can be designed for special applications. Engineering drawings, applications, advantages included.

12 BONDED DRY-FILM LUBRICANTS—*Alpha-Molykote Corp, 65 Harvard Ave, Stamford, Conn.* 4-page Special Print 461, "Inorganic Solid Film Lubricants," illustrated with tables, graphs, and line drawings, describes results of tests of inorganic, solid-film lubricant performances in liquid oxygen service and at pressures approaching complete vacuum. Investigations of their thermal stability and bearing torque at very low temperatures are also reported. Additional publication, Product Information Bulletin 242, presents characteristics, performance reports, and application instructions for Molykote X-15, an inorganic-bonded dry film lubricant specially formulated for extreme environmental service. It can be used from −300 to +1200 F.

13 THREAD ROLLS—*Detroit Tap & Tool Co, 8615 E Eight Mile Rd, Warren, Mich.* 8-page bulletin E-61 enumerates advantages of thread rolling and illustrates a variety of thread rolls. Bump type thread rolls for use on Brown & Sharpe, Reed, and Salvo machines are listed with prices. Straddle type are also listed, plus a range of plunge and through-feed type being used on Lanhyrol, Watson-Flagg, Reed and Grob machines.

● UNIVERSAL FORM RELIEVING FIXTURE—*R-O Manufacturing Co, 31171 Stephenson Highway, Madison Heights, Mich.* 15-page catalog discusses advanced R-O equipment and methods for performing form relief grinding on a variety of cutting tools. Setup and operation of the fixture and grinder are explained

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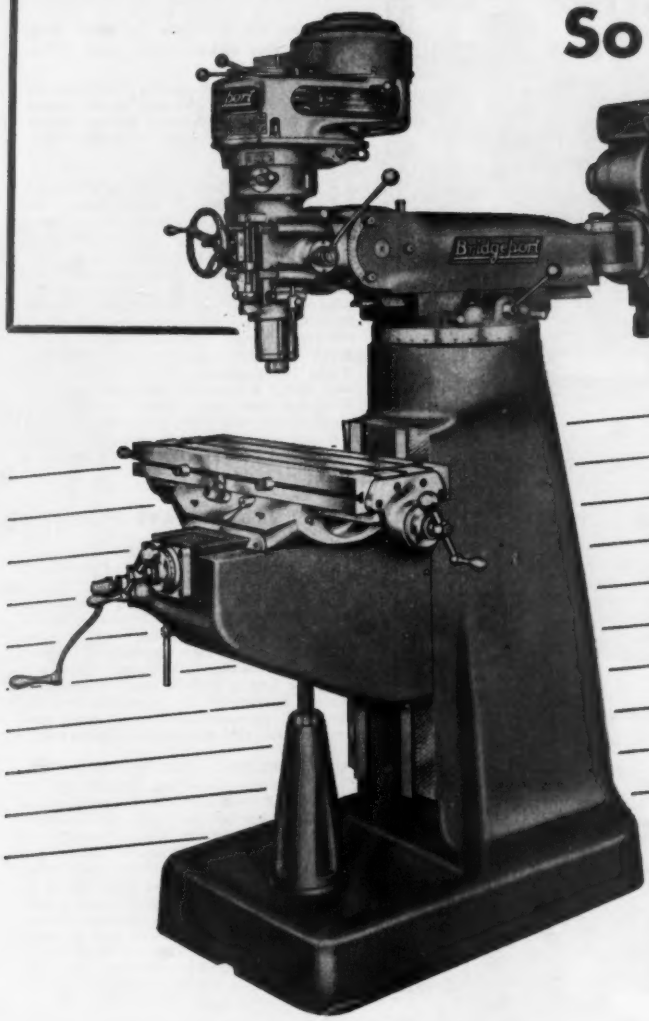

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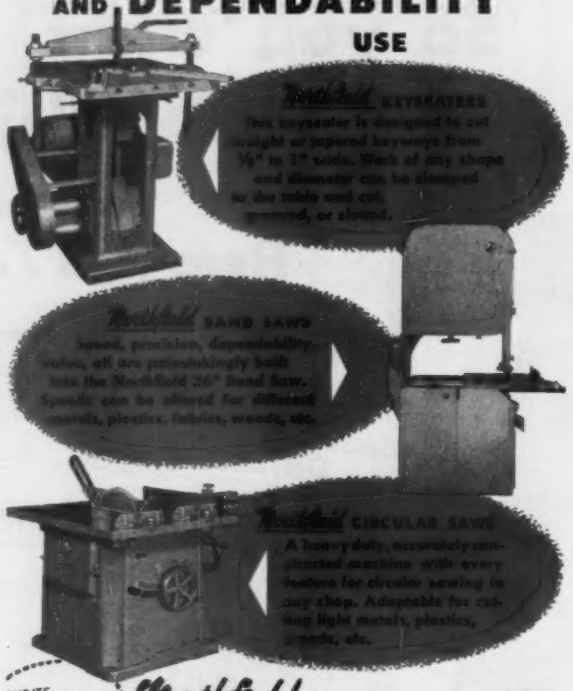

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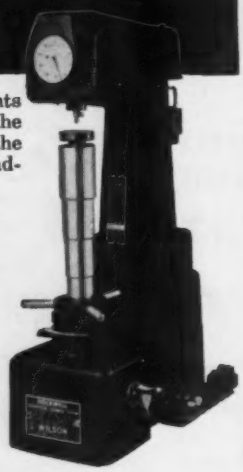

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with diagrams and photos. Includes descriptions of accessories such as the optical comparator and high-speed spindle attachment. Request direct on company letterhead.

14 ANALYTICAL INSTRUMENTS—*Philips Electronic Instruments, 750 S Fulton Ave, Mount Vernon, NY.* 28-page catalog, "Norelco X-ray Analytical Instrumentation," contains specifications and operating data on seven key instruments for research and production control. Describes Electron Probe Micro-Analyzers, Automatic X-ray Spectrographs, 100-kv Constant Potential X-ray Spectrographs, Portable X-ray Spectrometers, Standard Vacuum X-ray Spectrographs, X-ray Diffractometers, X-ray Diffraction units and cameras. A section deals with Geiger, scintillation, proportional and flow proportional detectors and shows the range of elements from magnesium (#12) through californium (#98) handled.

HEAT TREATING AND WELDING

15 ELECTRONIC TRACER—*Linde Co, Division of Union Carbide Corp, 270 Park Ave, New York 17, NY.* 4-page booklet, Form 55-043, describes how simple pencil line sketches of intricate shapes and forms can be used to guide oxygen shape-cutting machines with an electronic tracer known as the Linde photocell tracer. Illustrates how a built-in kerf compensator makes it possible to reproduce one or thousands of complicated metal parts with extreme accuracy from exact size drawings.

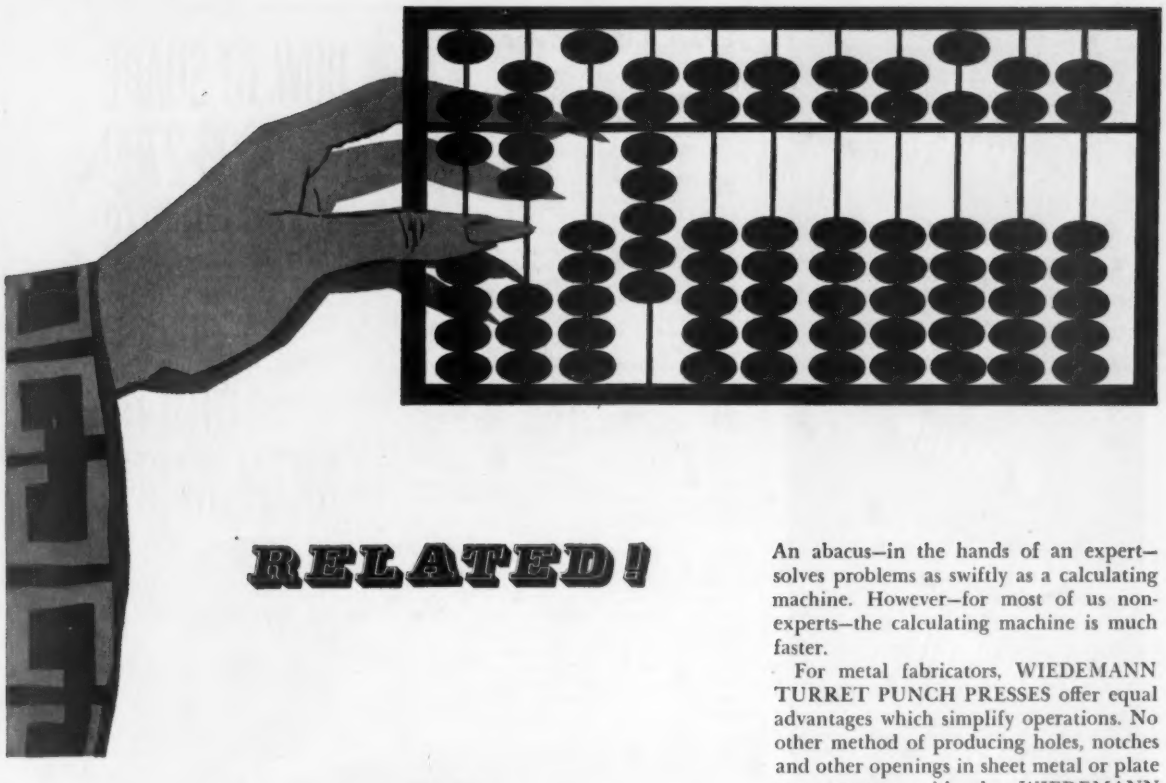
16 ELECTRIC INDUCTION FURNACES—*Hevi-Duty Electric Co, 304 Hart St, Watertown, Wis.* 12-page bulletin 3-FM-1 describes a new metal-melting process that improves tensile strength and machinability. Contains charts, photos, and cross-sectional diagrams of the full line of Hevi-Duty-Tagliaferri 60-c induction melting and receiving furnaces that use a controlled stirring action to produce homogenized, fine-grained metal of high strength and ductility. Corrections for analysis can be made right in the furnace, and even low-grade scrap can be refined into a high-quality common cast iron.

17 INFRA-RED OVENS — *Infra-Red Systems Inc, 240 Route 23, Riverdale, NJ.* Bulletin is a guide to use of gas and electric units for heating, drying, and curing. Illustrates seven representative infra-red ovens used for plastic fusing, conveyorized tray drying of powders, adhesive drying, metal pre-heating, armature repair, finishing, and scrap metal reclaiming.

PLANT SERVICE EQUIPMENT

18 DUST CONTROL—*Pangborn Corp, Hagerstown, Md.* 20-page bulletin 922A is prefaced with a short, non-technical explanation of the advantages available through proper dust control and lists basic essentials comprising a typical control system. Each Pangborn collector is described and pictured. Included are the new electric furnace exhaust hood and the CO cloth tube collector which is highly effective for high-temperature corrosive-gas applications.

19 CENTRIFUGAL PUMPS—*Industrial Filter & Pump Manufacturing Co, 5900 Ogden Ave, Cicero, Ill.* 8-page bulletin 301 illustrates and describes pumps designed specifically for corrosive service. Units can handle most corrosive solutions from aluminum chloride to zinc sulfate because of a variety of special pump linings compounded and molded at company's plant. Complete performance curves and technical data included.



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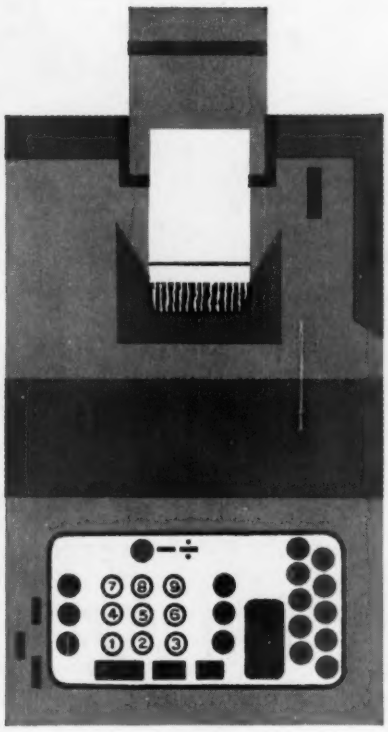

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20 BUFFING AND POLISHING MANUAL—*Lea Manufacturing Co, 16 Cherry Ave, Waterbury 20, Conn.* 20-page technical handbook covers manual or semi-automatic polishing, burring, satin finishing, buffing, and high coloring of metals, plastics, wood, and organic coatings on wood. Data includes finish selection, appearance, and characteristics, and the various production factors affecting different surface finishes. Also included are general application tables for various types of abrasive compositions.

21 FLOODED PLATE SCRUBBER—*John Wood Co, Air Pollution Control Division, Florham Park, NJ.* 4-page bulletin 170 details operation of unit for collection of fumes, mists, vapors, and particulate matter from exhaust gases and process equipment.

22 WET BLASTING—*Lord Chemical & Equipment Division, Wheelabrator Corp, 2068 S Queen St. York, Pa.* 24-page illustrated handbook 105 covers 40 cost-cutting finishing operations that can be performed through use of Liquamatte wet blasting equipment. Describes the way hand finishes can be achieved mechanically in a great variety of production processes, thereby providing a guide with which to analyze finishing operations.

23 STEEL SHELVING — *Standard Pressed Steel Co, Columbia-Hallowell Division, Box 875, Jenkintown, Pa.* 36-page catalog, Form 2791, discusses assembly features, component parts, and practical advantages of the three basic types of Hallowell steel shelving. Two types of adjustable shelving, Erectomatic and Erectomatic Clip-Type are illustrated and described, as well as Fixed-Type.

PARTS AND MATERIALS

24 FREE-MACHINING, FLAME-HARDENING PLATE STEELS — *US Steel Corp, 525 William Penn Pl, Pittsburgh 30, Pa.* 15-page publication provides detailed information on Fremax 45 and 15. The former is a high-strength, flame-hardenable, wear-resistant, high-carbon, high sulfur steel; Fremax 15 is a lower-carbon grade for normal free-machining applications.

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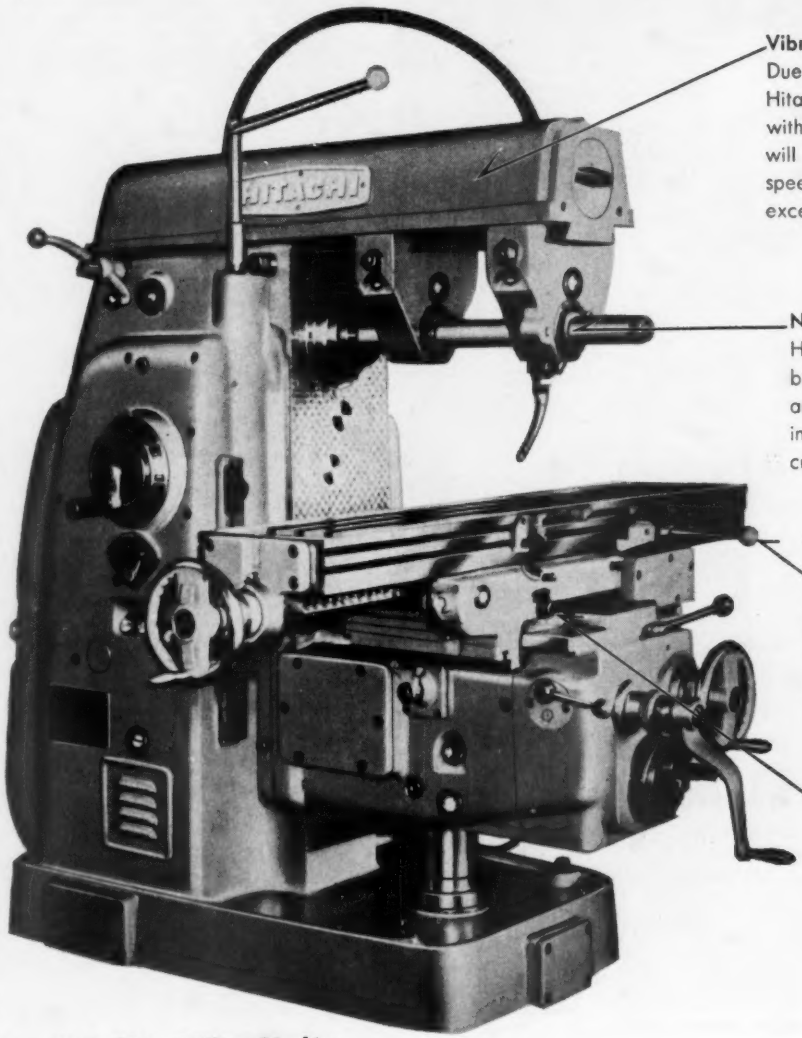

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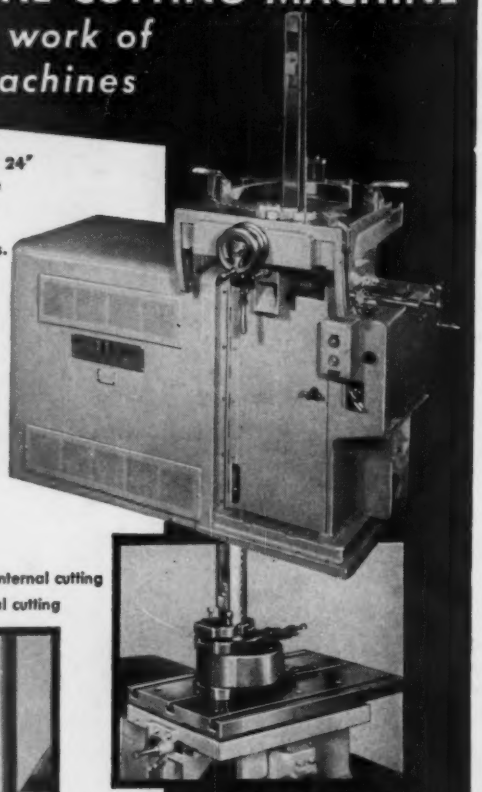
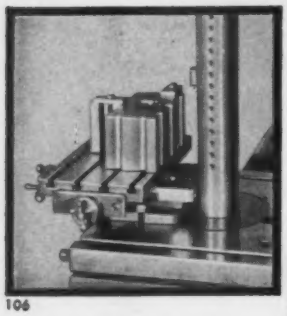


Right: Set-up for internal cutting

Below: Set-up for external cutting



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25 WOUND ROTOR MOTORS—*Louis Allis Co, 427 E Stewart St, Milwaukee, Wis.* 4-page bulletin 104 describes motor ranging in size from 1-30 hp. It has been completely redesigned to meet NEMA standards dimensions in frames 213 through 326U and features substantial reduction in size and weight for use in space-cramped locations. Furnished in open, drip-proof, or totally enclosed, non-ventilated enclosures for horizontal, ceiling, or side wall mounting.

26 PLASTIC—*Cadillac Plastic & Chemical Co, 15111 Second Ave, Detroit 3, Mich.* 24-page booklet describes properties and applications of Delrin acetal plastic. Covers design factors, including strength and toughness; dimensional stability and resistence to solvents, fabricating and finishing of both molded and machined parts. Discusses the use of the material in gears, bearings, and electrical applications. Ten applications are illustrated and described.

27 "ALUMINUM EXTRUSION INGOT"—*Aluminum Co of America, 726 Alcoa Bldg, Pittsburgh 19, Pa.* 12-page publication presents comprehensive information about extrusion ingot alloys, including data on one new composition and two alloys formerly unavailable in ingot. Details such extrusion alloy data as chemical composition limits, typical uses, mechanical properties, and recommended thermal treatment. Standard sizes and location of sources of Alcoa extrusion ingot included.

28 DRY FLUID DRIVES — *Dodge Manufacturing Corp, Mishawaka, Ind.* 20-page bulletin 70 provides a simplified method for selecting Flexidyne dry fluid drives and couplings. Eight stock drives and 11 stock couplings are listed for fractional to 1000-hp requirements together with installation photos. Includes tables of weights, dimensions, recommended V-belt drives for use with Flexidynes of various sizes.

29 SPECIFICATION BRONZES—*Ampco Metal Inc, Box 2004, Milwaukee 1, Wis.* 12-page illustrated bulletin G-61 describes 42 Ampcoloy bronzes plus heat treated variations. The alloys are classified in 11 basic categories including commercial aluminum bronzes, tin bronzes, manganese bronzes, and high conductivity alloys. •

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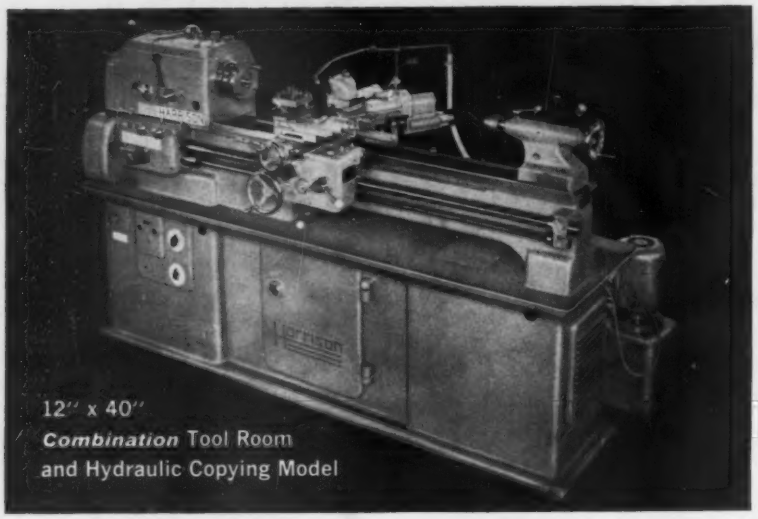

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7. Boring Mills
8. Broaching Machines
11. Chucking Machines
17. Drilling & Reaming Machines
25. Gear Cutting Machines
26. Grinding Machines
31. Lathes
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*Indicates 1940+ Model **Indicates 1950+

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*1212A Excello Dbl End. 4 Spdl 1943 RCG
**2U Simplex Dbl End Dbl Spdl Excel
**3U Stokerunit Dbl. End Dbl. Spdl. #DH-4 Heads
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*36" Bullard VTL, Side Head
*42" Bullard VTL w/Side Head
*54" Bullard VTL w/Side Head
*52" King VTL Side Head Clean
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*3" Universal Horiz. Tbl. Type (1941)
*5"—5H Sellers Floor Type—Nice Cond.

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**6 ton—54" Colonial Hydr Ser 13094, Excel.

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**HC & HCT Hardinge Chuckers. 1950 & later

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*1R Bakewell Radial Arm Drill 1 HP
*21" Canady Otte #4 MT 19" Dia. Table
**22" Allan Box Cal. 1 HP 6" Spdl. Feed
*25" No. 282 Barnes 4 MT. Air feed 3 HP
*28" Avey 2BMA6 w/Deep Hole Attch.
*28" Colubrn No. 4 MT. 3" cap. 10 HP

DRILLS, MULTIPLE SPDL.
*3 Spdl. Lee-Giff 5 Spdl. Base 3600 RPM 2 HP
*4 Spdl. Lee-Giff #2 MT 3600 RPM 1 HP
**6 Spdl. Allan #2KH-24". ½ HP Mtrs.
**36 Spdl. CSB Natco 2½" U.J. 28 x 54 Head
**24 Spdl. CSB Natco 1½" U.J. 20 x 30 Head

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*3' x 9" Cinc Bick w/Box Table
*8' x 11" Carleton Univ Box Table
*4' x 11" Carleton, Tp'g P. Elev., Tbl.
**4' x 11" Amer. "Hole Wizard" RBG

GEAR MACHINERY
**#53-2 Vinco Gear Checker Involute
*#13 Gleason Hypoid Cutter Sharpener
*#860B Mich. Gear Finisher, Microflex Counter
**#106 Gleason Gear Generator s/n 32036
*#12 Gleason Generator Dbl. Roll R & Finisher
*15" Gleason Spir. Bev. Cutter Grinder
*#00 & #1 Hamilton Hobbers

*Type A Barber Coleman Hobbers (1 long bed)
**65A3 Fellows Shaper w/access
*Type 6 Fellows #61 Shaper 35" OD Cap 1950

GRINDERS, MISC.
**Wendt Semis Esonogrind #1A195
**Blake Flue Grinder to ⅝" Cap
*4 x 12 Landis Ext. w/Plunge (2)
*6 x 18 Landis Ext. w/Plunge #24473
*12 x 36 Cinc. Univ. w/Int. Spdl. RBG
*16 x 36 Landis Cyl. w/5" Head
*18 x 18 Landis Cyl. Hydraulic
**Wickman Microform (optical) Like New
**180 Sheffield, Multiform (1957) Like New
**1109 Bryant Internal 6" Str. 9. swing Excel
**1316R Bryant Hole Face & Int. 28 Spdl (1952)
**2271 Heald "Sizematic" Internal RBG
*109 Bryant Int. New Spdl. (1947) RBG
**10x24 Cinc Univ. Plunge & Int Spdl (1953)
**10x24 No. 4BGI Van Norman 15" Head '55
**12x36 Landis Univ. Int Spdl (1950')
**30x48 Landis CHW Univ Like New 1952
*#2 Cinc. Centerless, Profile Dresser RBG

GRINDERS, INT.
*72A3 Heald TR Mod. & Sizematic Mod.
*16-16 Bryant Chucking 1600 RPM
**#172 Heald 36" Swg. 36" Str. '43 & '50

GRINDERS, SURFACE
*12 x 36 Mattison, Hydr. Dresser
*12 x 36 G & L Hydr. Crush Grind Attch. 15 HP
*36" Hanchett #36 Rotary. 30 HP
*16"—#11 Blanchard Vert Rotary RRG
**#240—30" Bosley Dbl. Opposed w/Ferris wheel

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*74A Excello Centerlap. 10 x 36. ½ HP
*26F Norton Hydr., Vert., 26" Cap. 10 HP

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**10 x 20 Monarch EE Mfg. Type 4000 RPM
*11 x 36 Logan w/collet attch. ½ HP
*12 x 96" Monarch T. R. Mod w/access.
*12 x 54 Monarch H. Ways TR Mod 1945
**15 x 54 LeBlond Dual Drive w/acces.
*18 x 110 L & S w/TA. Chucks etc.
*22 x 126 L & S w/Chuck, SR etc.
*30 x 84 American 18" Air Chuck Coolnt.
*40 x 68" LeBlond H.D. Dual Contr. 40 HP
*42 x 33 ft. Wickes H.D., 2 Carriages
*30" x 48" Monarch Mod CM, Ser. #16526
*20 x 120 Springfield Tool'g. 10 HP RCG
*24 x 96 LeBlond H.D., T. Att. Chuckh (1942)
*30 x 96 Niles "Timesaver" T.A. 3J, 4J RBG
*74 Star "T" Lathe, 15 HP Like New

LATHES, TURRET
**#2 B & L w/Barfeed. Collets etc.
*#4 Gisholt Univ. H Ways 2½" Cap
**#5 Gisholt Univ. H Ways 3" Hole
**#3 Gisholt, Barfeed, 1952, Excel.
*#3 W&S w/Hydr. Barfeed & Tool'g RCG
*#4 W&S Proselector, Air Chucker (1942)
**#5 Gisholt Univ w/Chucking (1950's) RCG
*8B J&L Saddle Type 3" Bar Cap.
*1A W&S Saddle Type 900 RPM
**3A W&S with Access. 1952 & 1943
**3L Gisholt & Presel w/CS Turret 1952
*2A W & S Saddle Type 3½" Cap B. Feed

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**Gisholt Simplematic Autom 20", Reatten Table.
**17 x 76 Seneca Falls "Le Swing" 50 HP.

LATHES, TRACER
*30H Bullard 3 Spdl. Man-Au-Trol #26104
**60" Monarch "T" w/generator (1952)
**32x96 LeBlond Hydro Trace (1959)
*36"x36" Monarch H.D' w/Keller Tracer

MILLS
*3K K&T Horiz. Ser. RBG
*4K—K&T Horiz., 18x42 Tbl. Trvl. 15 HP
*5HM—K&T Horiz. 18x94" Tbl 20 HP
**#4 Cinc H.S. D.T. Vert Mill (1951)
**2-24 Cinc Autom #50 MT Autom Quill Retr.
**#32—1248 Sundstrand R&F Rigidmills (1952)
**33—2448 Sundstrand Rigidmill 15 HP '52
*56x96 Cinc. Hydrom., Simplex RCG
*36x36x146" Ingersoll Planer, 4 Heads
**Beam Mill, Onsrud Mod A288—Tracer Controlled

MILLS — TRACER
*28-60 Cinc Vert Hydrotel 360° RCG
*28-96 Cinc Vert Hydrotel Hand & Depth Controls
**36-96 Cinc Vert Hydrotel 3D Controls
*36-72 Cinc Horiz Hydrotel Dual Controls

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*16"—8 Spdl. Bullard Type D RCG

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*65 Ton #74 Bliss gap frame 13x26 Bed
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**75 Ton Watson Stillman Hydr 20" Str.
*80 Ton #7 Federal OBI 7 & 12" Str.
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400 Ton Cleveland Toggle Model 90T96 RBG

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**20" Doall "Contourmatic" V. Band Hydr.
**36 DoAll H.S. Vert. Band., Hydr. Tble (1953)

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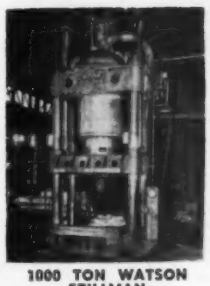

1000 TON WATSON STILLMAN
Down moving, 4 column with pullback cylinders and safety head
Bed area: LR 63, FB 60
60" Daylight, 48" Stroke
32" ram diameter, 9" columns, 21" x 63" between columns.
60" x 60" top platen, self-contained, 75 Hp 2500 Psi, 6' x 8' floor area
Overall dimensions: 6' x 9' x 18'

200 TON H.P.M. FASTRAVERSE
High Speed, Down moving, straight side (tie rod)
Bed area: LR 31", FB 31"
6' max. Daylight, 37" Side Clearance
60" max. ram, 14" ram diameter, 2600 PSI operating pressure.
4' x 6' LR floor area, 22' high

100 TON PRENTISS
Oil Gear, Down Moving, Double Acting
Bed area: LR 36", FB 36"
24" Stroke, straight side (with tie rod)
11" ram diameter, 54" high main ram, 36" pullback
23" max. work height, 40" bed to crosshead, self-contained.
With prefill tank, pump—oil gear—adj. volume, flat belt drive by G.E. 3/60/440 motor.
6' x 4' floor area, 15' high

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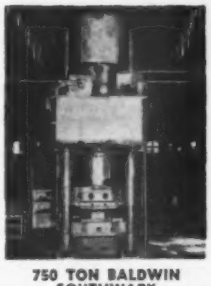

750 TON BALDWIN SOUTHWARK
Down moving, 4 column with pullbacks
Bed area: LR 53", FB 42"
48" Daylight, 40" Stroke
25" ram diameter, 9" post diameter, 53" x 31" between columns.
Self-contained motor and pump, 53" x 42" ram area w/4 "T" slots 1"
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3B Pratt & Whitney Jig Borer, 1943. Used 100 hours, like new condition $13,500
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3K, K&T Vert. Mill w/Rotary Table, Late, Excel Cond.

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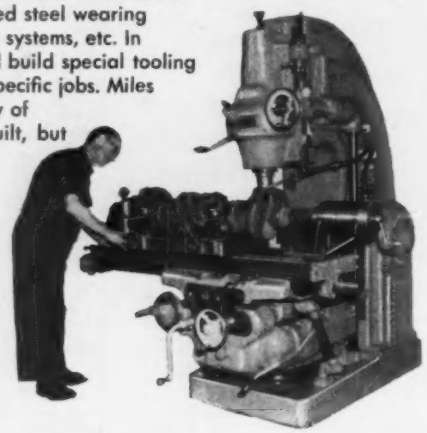

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#5H K & T Plain Mill, Late
⅞" Kane & Roach Shape Straightener
27"x22' c Niles Lathe, Late
14"x36" Mattison Eyd. Surface Grinder
6x18 Thompson Hyd. Surf. Grinder
4'15" Cinc Gilbert Radial drill Elec. arm & Column Clamp Rapid Traverse
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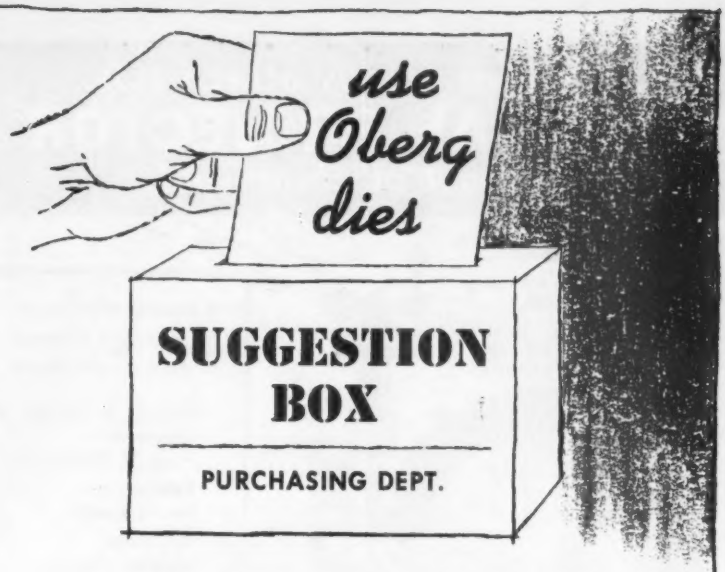

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Some find what they are looking for in the editorial pages, some in the advertising by manufacturers, some in the "Searchlight" advertisements. The latter includes many advertisements seeking or offering "something" — used, rebuilt, surplus new equipment, or a business opportunity that you may be able to supply, or want.

You will always find checking the "Searchlight" ads interesting, informative and profitable.

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This is an all new 1½" bar capacity ram type turret lathe with power feeds to all 8 working stations . . . that in addition to bar and collet work also has the versatility to do chucking, and when needed, single point threading. Powered by a 5 h.p., two-speed, geared motor, the new Sheldon 3 R turret lathe provides 16 spindle speeds, 60 different feeds to the carriage and cross-slide, and 180 different feeds to the ram turret.
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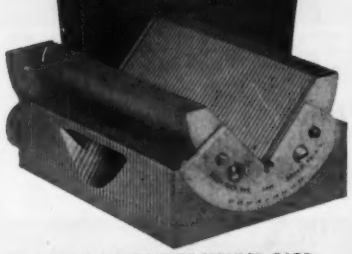

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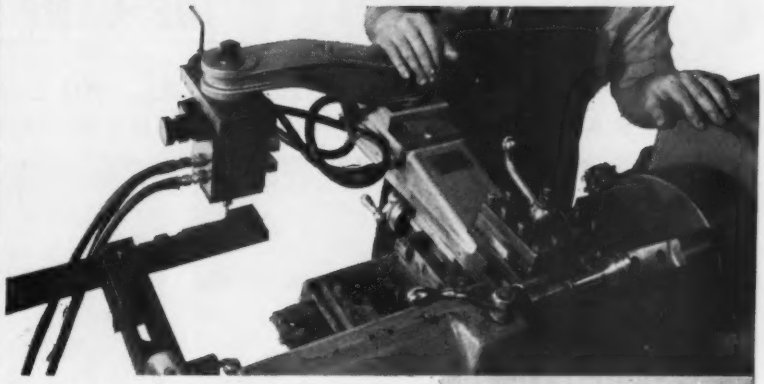

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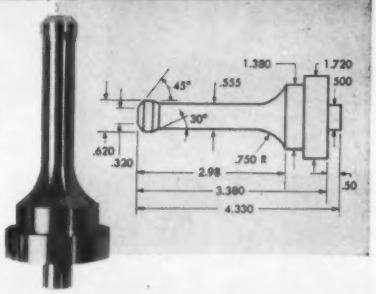

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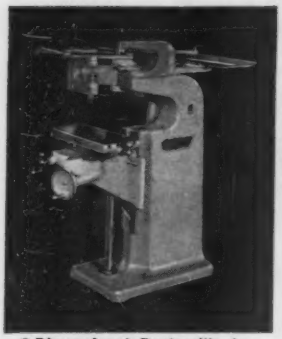

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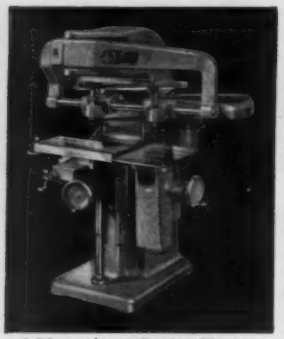

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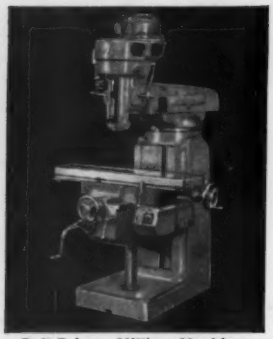

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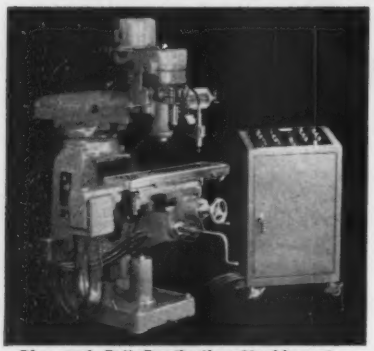

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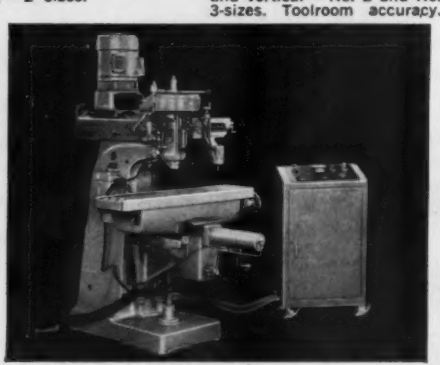

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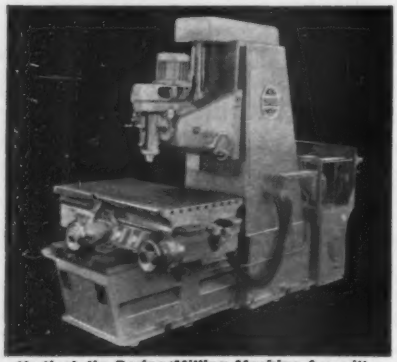

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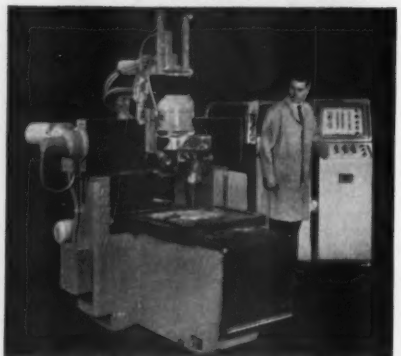

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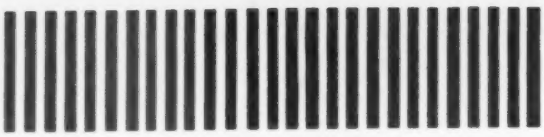

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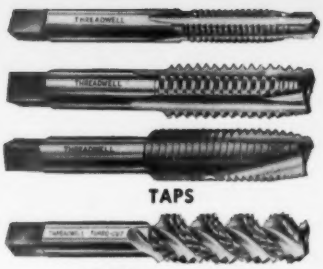

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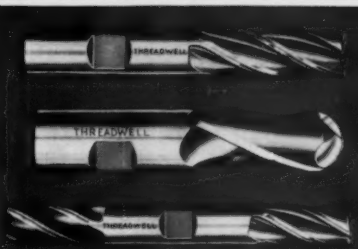

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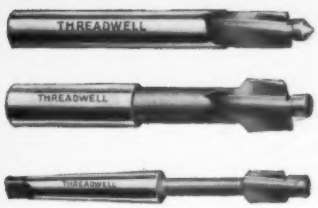

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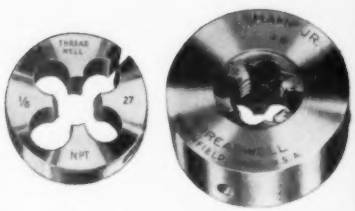

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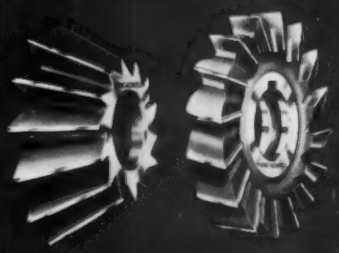

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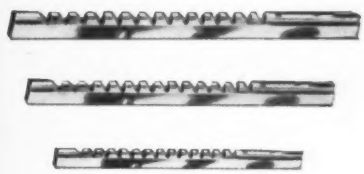

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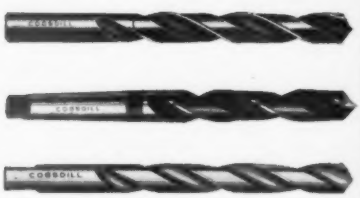

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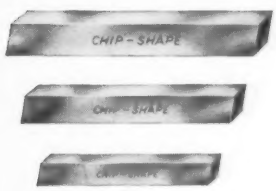

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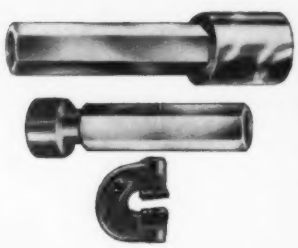

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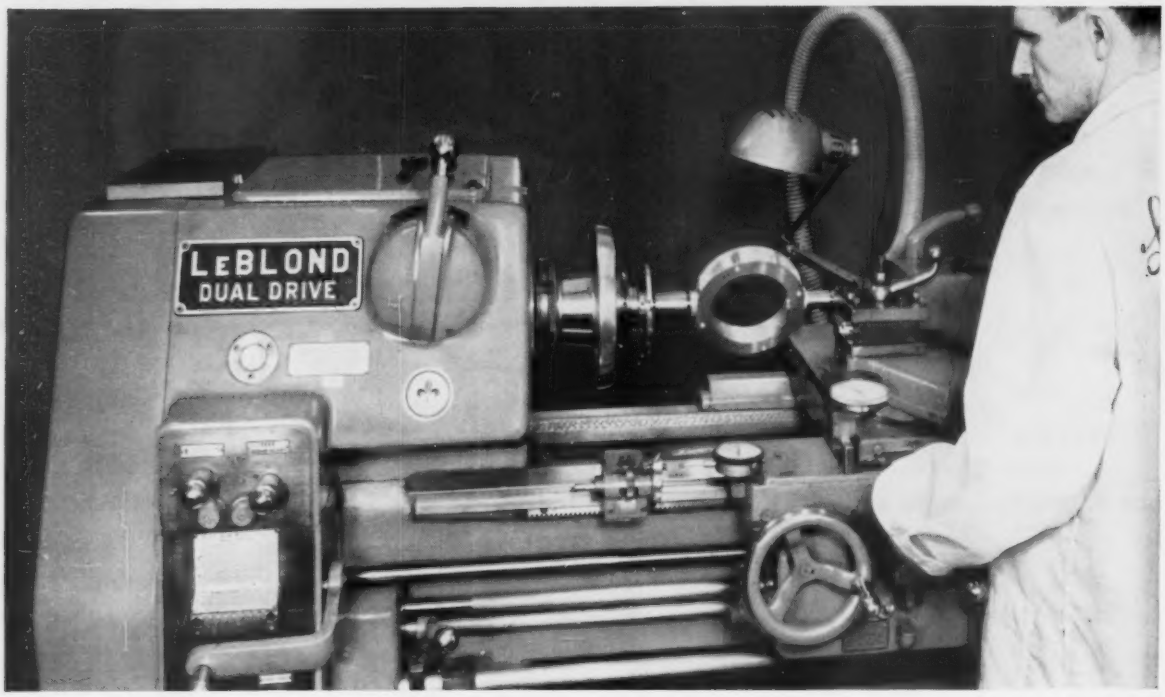
CIRCLE 252 READER SERVICE CARD

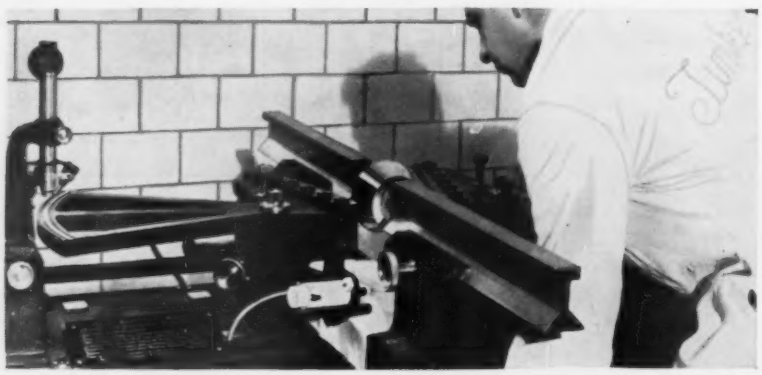
LeBLOND with special Timken® "00" bearings ...spindle runout less than .000025″



To give a customer a special, new high in precision in its 15″ Dual-Drive lathe was the problem for LeBlond engineers. The customer's product was a super-precise beryllium gyro float assembly. Diameter of the sphere: 1.8750″. Work specifications called for the spherocity to be held concentric with the two major axes within .0005″ total indicated runout.

To meet this, LeBlond specified Timken® super-precision "00" tapered roller bearings held to .000025″ assembled runout—one-third the normal runout tolerance. Timken bearings were also used on the intermediate, back and feed shafts of the drive. The assembled spindle runout (total indicator reading) was actually less than .000025″.

Producing super-precision bearings like this is typical of Timken Company service. The kind of service that developed Timken "00" bearings to meet industry's needs for ever-greater precision. It's another example of the Timken Company's leadership in tapered roller bearing design and manufacture.



ACCURACY IS ASSURED for Timken "00" and *all* Timken bearings by our modern gage laboratory, one of industry's finest. Some instruments we use are capable of comparing sizes to .0000005″. Such precision is another reason why American machine tool manufacturers prefer Timken tapered roller bearings.

Industry rolls on

TIMKEN®

tapered roller bearings

The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ontario.

CIRCLE 253 READER SERVICE CARD